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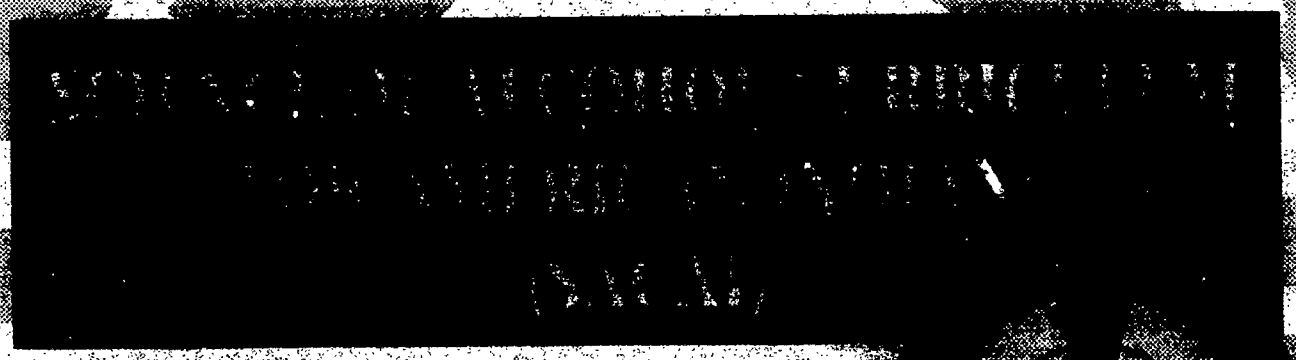
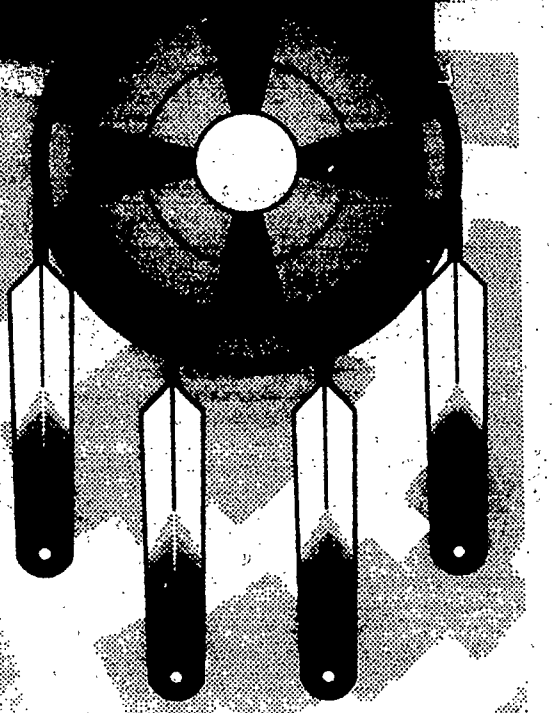
ABSTRACT

This curriculum provides American Indian youth with a framework for learning about the effects of alcohol on the body and the community. The curriculum stresses the development of scientific thinking skills and was designed for upper elementary and middle level students. The guide consists of four units: How Does Alcohol Circulate through the Body and Community?; How Does Alcohol Deprive the Body and Community of Energy?; What is Fetal Alcohol Syndrome and How Does It Affect a Community?; and How Does Alcohol Impact the Brain and the Community? Units explore the meaning of community and discuss types of communities, ways communities solve problems, and how alcohol contributes to the breakdown of community values and functioning. The involvement of community members helps to provide meaningful applications of what students learn through the curriculum. Each unit includes an Indian story that allows students to draw upon traditional knowledge to better understand problems associated with alcohol. The concept of the medicine wheel is emphasized throughout the curriculum to provide students with a holistic and interdisciplinary approach to studying the effects of alcohol. Each unit also includes a holistic statement, goals and outcomes, interdisciplinary connections, instructions for student journals, instructions for use of a student sharing box, alcohol and science background summaries for teachers, science learning activities, unit review activities, small group activities, needed materials, teacher preparation, and assessment. (LP)

The American Indian Science and Engineering Society (AISES)

presents





Michael Dorris (Modoc)
Author of *The Broken Cord*

"The SACAI curriculum strikes me as intelligent, innovative, and important. I would urge all schools to consider its implementation and heartily endorse its goals and objectives."

Science of Alcohol Curriculum for American Indians (SACAI)

An Interdisciplinary Approach to the Study of the Science of Alcohol for Upper Elementary and Middle Level Students

American Indian Science and Engineering Society
1630 30th Street, Suite 301
Boulder, CO 80301

This project was supported, in part, by the
National Science Foundation
Opinions expressed are those of the authors and not necessarily those of the Foundation

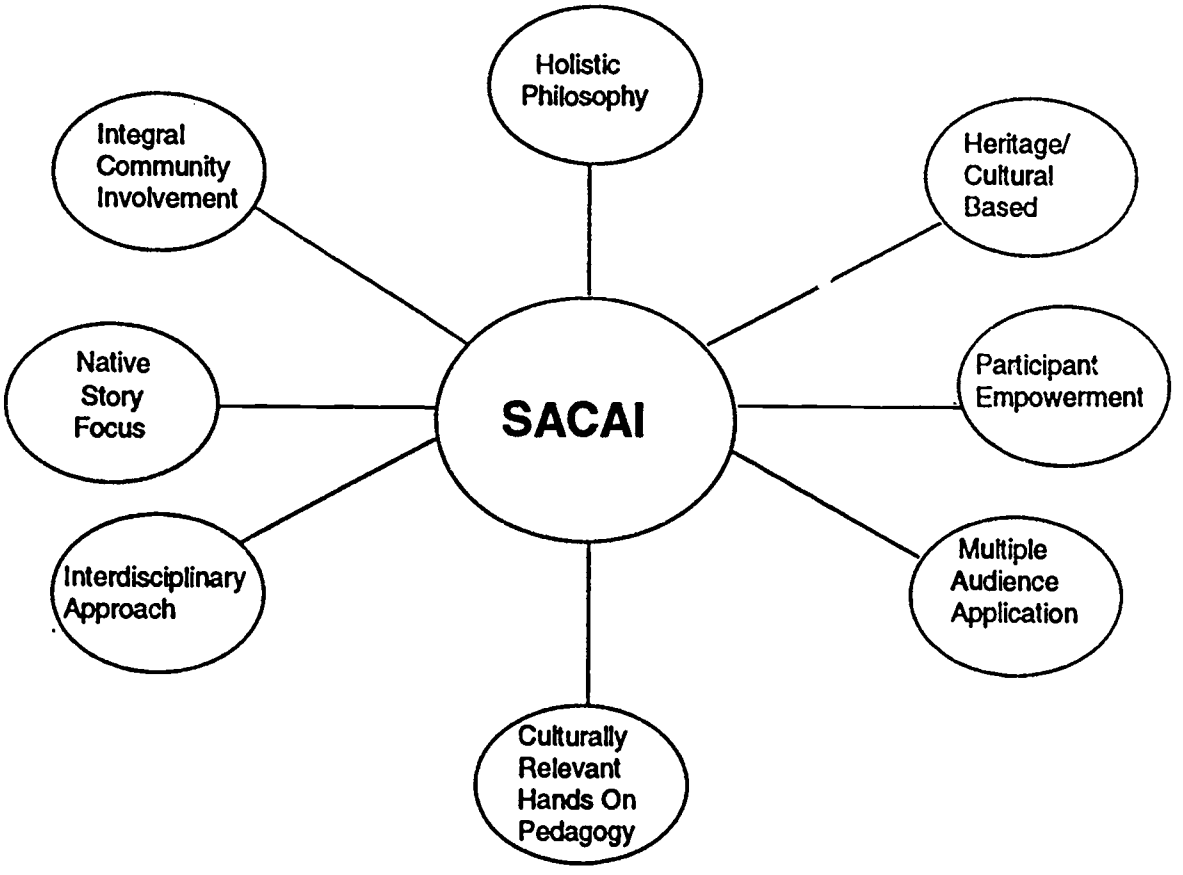
Science of Alcohol Curriculum for American Indians (SACAI)

About SACAI...

This curriculum provides American Indian youth a framework for learning about alcohol in the body and community. The activities in these units were specifically designed around the interests and skill levels of upper elementary and middle level students. Meaningful cultural connections allow American Indian students to personalize their study of this curriculum into relevant learning experiences.

Each unit contains a story that allows students to draw upon traditional knowledge and wisdom to better understand the problems associated with alcohol. The concepts of the medicine wheel, emphasized throughout the curriculum, provide students with a holistic and interdisciplinary approach to studying SACAI. Ongoing community involvement within the curriculum ensures that student learning occurs in a relevant cultural context.

As students study SACAI, they are challenged to work in non-competitive ways to expand and reflect upon their knowledge of the science of alcohol. Students work with community members, each other, and their teachers to actively and openly discuss alcohol in the body and community.



OVERVIEW OF SACAI DEVELOPMENT AND TESTING

Curriculum: Four units with introductory information for teachers:

How Does Alcohol Circulate through the Body and Community?
The study of alcohol's effects on the veins, arteries, and capillaries, including how alcohol diffuses throughout the body. How the effects of alcohol circulate through a community is also discussed.

How Does Alcohol Deprive the Body and Community of Energy?
The study of how alcohol affects the stomach, small intestine, and liver, depriving the body of necessary nutrients and energy. How alcohol deprives the community of energy is also explored.

What is Fetal Alcohol Syndrome and How Does It Affect a Community?
The study of fetal alcohol syndrome, along with the role of parents and the community in preventing this condition.

How Does Alcohol Impact the Brain and the Community?
The study of how alcohol affects the cerebrum, cerebellum, and medulla, and how associated behaviors affect the community.

Development: Three-year development process involving over 150 educators of American Indian students in the U.S. and Canada, including a Cultural Advisory Group. Drawings in the curriculum were completed by American Indian teachers and students. Forty-three tribes from urban and rural settings were represented, including individuals from the 10 largest tribes.

Field Review: Prior to and during field tests, SACAI was extensively field reviewed by over 100 individuals representing the AISES Board of Directors, the Cultural Advisory Group, educators, scientists, and Indian education specialists. Several revisions were made.

Field Testing: SACAI has been extensively field tested and evaluated in over 50 different classrooms in predominantly American Indian schools on reservations, in other rural areas, and in selected urban areas in 21 states, Washington, D.C., and Canada. Site visits were made to several of the field testing sites for observation of SACAI.

Students: Nationwide, over 1,200 American Indian students in the upper elementary and middle level grades have studied all or part of SACAI during its development.

Dissemination: Nationwide dissemination of the SACAI curriculum has begun.

Evaluation: Ongoing evaluation includes interviews, classroom observations and site visits, rating scales and questionnaires, and written testimonials by students and teachers.

Materials List and Software: Students use numerous hands-on materials to complete the units. A materials list is included. Computer software to reinforce student learning through animated, visual computer interactions is currently in development.

For more information, contact: The SACAI Project, American Indian Science & Engineering Society (AISES), 1630 30th Street, Suite, 301, Boulder, CO 80301; (303) 492-8658, fax: 303-492-3400, Internet: aises@spot.colorado.edu

The SACAI Curriculum

The following are included in the curriculum in order for SACAI to be effective in addressing the problem of alcohol abuse in American Indian communities.

Community Involvement: The involvement of community members in the units is an essential component of SACAI. Because the effects of alcohol reach beyond the individual and classroom and even beyond the family, students examining the effects of alcohol on the various systems and organs of the body need to see the extension of those effects. The presence of one or more community members in the curriculum enhances learning by providing meaningful applications of what students are learning. Each unit begins by exploring the meaning of community, discussing types of community, the ways communities solve problems, and how alcohol contributes to the breakdown of community values and functioning. This component adds power and meaning to the information learned in each unit. Although involving the community in the curriculum may be sometimes difficult and time consuming, SACAI is strengthened by being taught along with community involvement.

Unit Story: The Indian stories and cultural concepts help students connect with and interpret in a meaningful way the material they are studying. Stories written specifically for each unit provide a cultural parallel with the science studied. They are vehicles for students to talk about alcohol's effects on individuals, families, and communities. Explorations of the story and reference to it throughout the unit provide cultural relevancy to the interdisciplinary work of each unit.

Medicine Wheel: The Medicine Wheel serves as the philosophical underpinning of SACAI. The concepts of balance, harmony, and interdependence represented by the Medicine Wheel are incorporated throughout the curriculum. SACAI emphasizes the physical, mental, spiritual, and emotional aspects of the Medicine Wheel and alcohol's negative effects on each aspect. The interrelationships demonstrated by the Medicine Wheel provide ways to understand parallels between alcohol in the body and alcohol in the community. For more information on the Medicine Wheel, see The Sacred Tree.

Student Interaction: The most effective educational structure for American Indian students is small, cooperative work groups. SACAI involves students in small groups and pairs in order to encourage interaction among peers that might not otherwise take place. By functioning as members of a classroom community in problem-solving activities, students learn information and practice skills that can help them and their communities address the problems of alcohol abuse.

Teacher Facilitator: SACAI requires students to problem-solve to complete hands-on activities through interaction with peers. An important role of the teacher in SACAI is to facilitate student learning. Rather than merely conveying information, the teacher facilitates the effective functioning of the groups or pairs of students where students do things for themselves.

Interdisciplinary Connections: The SACAI units involve use of a variety of concepts and skills in interrelating journal writing, math, science, social studies, art, reading, and literature. Skills from any subject area can be used to solve problems in integrative ways as students complete response forms and hands-on activities.

SACAI Process and Content: SACAI supplements the science that students have studied previously or are currently studying. The units reflect the approximate level of difficulty and depth found in existing science curricula. SACAI teaches the effects of alcohol on the systems studied in the units. However, the process of learning SACAI is as important as the content learned. The experience of observing, asking questions, working with others to solve problems, applying information to the community, and manipulating materials to solve problems provide the basis for successful completion of SACAI.

Adaptation to Own Classroom: The SACAI units provide a framework for studying the effects of alcohol on the body and community. However, the success of the program relies on each teachers adapting one or more elements of the curriculum to meet local student needs and cultural relevancy. The story, the community involvement, and the activities must reflect the particular needs and values of the students and community involved. Each component is essential and is critical to the success of SACAI. Implementation in each setting however, depends on a certain level of adaptation that only the teacher's knowledge can guide.

SCIENTIFIC THINKING SKILLS IN SACAI

SACAI includes experiences that help students develop, practice and apply skills for scientific thinking, all of the following skills are incorporated throughout the unit:

Observing

Students use their senses to gather information about objects and events in the SACAI activities.

Communicating

Students convey information through oral, written or pictoral activities such as discussion, writing in a journal, or illustrating a response.

Comparing

Students use measurement as a way to describe or compare objects and events in many of the SACAI activities.

Organizing

Throughout SACAI students are required to categorize, group and classify material in acquiring knowledge or the science of alcohol and the effects on the community and the body.

Relating

Students identify cause and effect relationships throughout the curriculum, exploring the relationship between alcohol and bodily and community functions.

Inferring

In this curriculum students are asked to write or draw their generalizations based on observations and data.

Applying

Throughout SACAI, students learn to apply their knowledge and skills to the problems of alcohol in the body and in their community in a variety of ways.

Participants in SACAI Development

Cultural Advisory Group

Geneva Charley *(Wasco/Warm Springs)* - Warm Springs, OR
Bob Frazier *(Choctaw)* - Boulder, CO
Charlotte Herkshan *(Warm Springs)* - Warm Springs, OR
Wendell Jim *(Paiute Wasco/Yakima)* - Warm Springs, OR
Roberta Manuelito *(Navajo)* - Boulder, CO
Norma Rendon *(Oglala Sioux)* - Pine Ridge, SD
Bob Whitman *(Navajo)* - Boulder, CO

Curriculum/Science Educators

Mary Adams - Greeley, CO
Susanne Aikman *(Eastern Cherokee)* - Denver, CO
Al Benalli *(Jemez/Navajo)* - Pueblo of Acoma, NM
Suzanne Benally *(Navajo)* - Boulder, CO
Ruth Bradford *(Chippewa)* - Batesland, SD
Carol Bergevin - Aurora, CO
Judy Capra - Golden, CO
Catherine Collier, Ph.D. - Portland, OR
Mia Cramer *(Navajo)*- Albuquerque, NM
Carol Davis *(Turtle Mountain Chippewa)* - Belcourt, ND
Susan Yellowhorse Davis *(Oglala Sioux)* - Thornton, CO
Heather Duffy - Louisville, CO
Roger Echo-Hawk *(Pawnee)* - Longmont, CO
Theresa Halsey *(Hunkpapa Lakota)* - Boulder, CO
Bernice Harris - Boulder, CO
Esther Larocco - Chico, CA
Jane Larson - Boulder, CO
Stella Logan *(Oglala Sioux)* - Boulder, CO
Lynn Lopez von Huben - Boulder, CO
Barb Mieras, Ph.D. - Boulder, CO
Joann Sebastian Morris *(Sault St. Marie Chippewa/Oneida)* - Aurora, CO
Cornel Pewewardy, Ph.D. *(Kiowa/Commanche)* - St. Paul, MN
Julie Phillips - Boulder, CO
James Richmond, Ph.D. - Chico, CA
Tony Rocha *(Ute)* - Durango, CO
Michael Schwartz, MD - Denver, CO
Cecilia Silva, Ph.D. - Chico, CA
Carolyna Smiley-Marquez, Ph.D. *(San Juan Pueblo)* - Longmont, CO
Dawn Smith *(Klamath)* - Warm Springs, OR
Carol Strom - Vermillion, SD
Wally Strong *(Yakima/Nez Perce)* - Santa Fe, NM

Alcohol and Drug Abuse Experts

Della BadWound *(Oglala Sioux)* - Denver, CO
Susan Yellow Horse-Davis *(Oglala Sioux)* Thornton, CO
John Gilbert, Ph.D. - Boulder, CO
Judy Grisel, Ph.D. - Boulder, CO
Robin LaDue, Ph.D. *(Cowlitz)* - Seattle, WA
Paul Markel - Boulder, CO
Sandy Nelson *(Crow)* - Lafayette, CO
Le Ann Wall *(Chitimacha)* - Mission, SD

Participants in SACAI Development (cont.)

Teachers

Marvin L. Amos *(Yurok)* - Chiloquin, OR
Rod Avery *(Choctaw/Creek)* - Laguna, NM
Theresa BearKing (*Sioux*) - Fort Yates, ND
Joe Beydler - Boulder, CO
Anne Biewer *(Cheyenne River)* - Wahpeton, ND
Wayne Bruckner - Shawno, WI
Fredda Butler - Toledo, OR
Patsy Cajete *(Pueblo)* - San Juan Pueblo, NM
James Capps - Chinle, AZ
Anna Maria Colette - Markleeville, CA
Sandy Cowen - South Lake Tahoe, CA
Colette Cozort - Kendrick, ID
Robert Croft - Boulder, CO
Jeremiah Cronin *(Algonquin)* - Santa Fe, NM
Larry Crowley - Boulder, CO
Sally Crowley - Boulder, CO
Dave Curtis - Pendleton, OR
Christine Dickenson - Cloquet, MN
Allen Doering - Second Mesa, AZ
Ronne Fire-Egert *(Dakota/Lakota)* - St. Paul, MN
Wilma Godwin - Fairmont, NC
Kim Green - Aurora, CO
Rob Hastings - Madras, OR
Heidi Hermansen - Aurora, OR
Dorothy Jefferson - San Luis Obispo, CA
Mike Jojola *(Isleta)* Isleta, NM
Pat Jojola *(Isleta)* - Isleta, NM
Carmen King *(Acoma)* - Laguna, NM
Walter Koyawena *(Hopi)* - Second Mesa, AZ
Katie Kyhkynen - Duluth, MN
Tammy Meyer - Boulder, CO
Scott Miller - Boulder, CO
Kathryn Mitchell *(Chippewa)* - Minneapolis, MN
Art Ochoa *(Klamath)* - Bonanza, OR
Foster Odom - Pendleton, OR
Sharon Stands Overbull *(Crow)* - Pryor, MT
Yvette Peguero *(Menominee)* - Oneida, WI
Carolyn Penning *(Ojibwa/Patawatomi)* - St. Paul, MN
John Pilch - Lodge Grass, MT
Paul Poetsch - Bonanza, OR
Greg Pohll - Chiloquin, OR
Andrea Pokrzywinski - Cloquet, MN
Al Pyatskowit *(Menominee)* - Shawano, WI
Joyce Rock *(Cherokee)* - Muskogee, OK
Quin Roman Nose *(Cheyenne)* - Watonga, OK
Georgerene Russell *(Shoshone)* - Riverton, WY
Sylvia Sather - Denver, CO
Donna Scott *(Cherokee)* - Hoopa, CA
Josie Suarez - Thoreau, NM

Participants in SACAI Development (cont.)

Dorothy Terrell - Berkeley, CA
Darlene Todichine *(Navajo)* - Chinle, AZ
Marilyn Tyler - Toledo, OR
Dolly Walawander - Missoula, MT
Margery Walker *(Sioux, Navajo)* - Hiawatha, KS
Amelia Watson *(Navajo)* - Many Farms, AZ
Theodora Weatherwax *(Blackfeet)* - Browning, MT
Sheri Wood - Terrebonne, OR
Kay Wright-Milton - Freewater, OR
Peter Zazzie - Cuba, NM
Tina Norvell *(Walla Walla-Assiniboine)* - Pendleton, OR
Winona Wilson *(Santee Sioux/Navajo)* - Minneapolis, MN
Don Ziegler - Zuni, NM

Artists

Michelle Bertholf - Boulder, CO
Debbie Echo-Hawk *(Pawnee)* - Boulder, CO
Walter (Bunky) Echo-Hawk *(Yakima)* - Boulder, CO
Daniel Marshall *(Sisseton-Wahpeton Sioux)* - Denver, CO
Robert Rendon *(Oglala Sioux)* - Pine Ridge, SD
Arne Willetto *(Navajo)* - Boulder, CO

Program and Curriculum Evaluators

Jim Anderson, Ph.D. - Chico, CA
Jim Bransford, Ph.D. - Albuquerque, NM
Charles G. Zartman, Ph.D. - Chico, CA

The development of this curriculum was coordinated by the following AISES staff:

Norbert Hill, Jr (Onieda)	Project Investigator
John Hoover, Ph.D.	Project Director
Cecelia Jacobs	Project Coordinator
Abbie Willetto (Navajo)	Curriculum Developer
Debbie Rabideau	Curriculum Developer
Diane Bussa	Research Associate
Linda Matson	Research Associate

**Many different people have been involved in the development of this curriculum and we have attempted to include everyone in this list of participants. If we have inadvertantly left someone off the list, please let us kno."*

MATERIALS

How Does Alcohol Circulate through the Body and Community?

30 droppers
30 clear plastic cups
15 graduated cylinders
15 - 5" pieces of red yarn
15 - 5" pieces of blue yarn
16' of dialysis tubing
1 glue stick
1 container of food coloring
1 spool of thread
1 driving manual from your state
1 roll of masking tape
journals

How Does Alcohol Deprive the Body and Community of Energy?

30 clear ziplock bags
30 droppers
3 lbs. of sugar cubes
1 bottle of rubbing alcohol
4 cups of macaroni
15 - 1" pieces of cotton cloth
15 - 1" pieces of terry cloth
30 clear plastic cups
1 bottle of oil
1 bottle of dish soap
30 stirring rods
journals

How Does Alcohol Affect the Brain and Community?

15 rulers
45 paper cups
1 box of paper clips
1 roll of masking tape
1 box of toothpicks
15 sheets of construction paper
1 box of rubberbands
journals

What is Fetal Alcohol Syndrome and How Does it Affect the Community?

The video is necessary for the completion of the unit. It is not provided but it can be ordered for $29.95 at the following address:

VIDEO

Babies In Waiting

Family Care Communications, Inc.
Eden Prairie, MN 55347
612-944-5350

The following items are recommended, but can be supplemented or replaced by other materials from your area.

BOOKLETS/BROCHURES

Protect Our Future, Prevent F.A.S.	Health Education Dept. Box 1210 Whiteriver, AR 85941 602-338-4953
A few drinks can last a lifetime. *If you are pregnant...don't drink.*	NOFAS 1815 H Street, N.W. Washington, D.C. 20006
Alcohol and Pregnancy. *Make the Right Choice* *Making the Right Choices*	March of Dimes Birth Defects Foundation 1275 Mamoronick Ave. White Plains, N.Y. 10605
Learn About Alcohol, ISBN #0-89486-205-7 *Fetal Alcohol Syndrome, ISBN* #0-89486-080-1 *Learn About F.A.S. and F.A.E., Order #1357*	Hazelden Educational Material 15251 Pleasant Valley Road Box 176 1-800-328-9000
A Fetal Alcohol Syndrome Resource Guide	Indian Health Service Fetal Alcohol Syndrome 300 San Mateo N.E. Suite #600 Albuquerque, N.M. 87108 505-262-6112
A Manual On Adolescents and Adults With Fetal Alcohol Syndrome With Special Reference to American Indians	Dept. of Psychiatry and Behavioral Sciences Univeristy of Washington Seattle, WA 98195
Have You Heard ...About Alcohol and Pregnancy	Association for Retarded Citizens Box 6109 Arlington, TX 76005

How Does Alcohol Circulate through the the Body and Community?

An Interdisciplinary Approach to the Study of the Science of Alcohol for Upper Elementary and Middle Level Students

SACAI Unit One

American Indian Science and Engineering Society
1630 30th Street, Suite 301
Boulder, CO 80301

Post Assessment - Teacher
How Does Alcohol Circulate through the Body and Community?

Teacher: _____

School/State: _____ _____

Grade Level(s): _____

Percent American Indian in School/Tribe(s): _____ _____

Number of Classes/Students: _____ _____

1. In what ways did the community members help the students in understanding the problem of alcohol in the community?

_____

_____

2. In what specific ways did the curriculum challenge the students to use their critical thinking and problem solving skills?

_____

_____

3. How did the students demonstrate creativity in completing the Post Unit Assessment Activity?

_____

_____

4. What instructional adaptations did you have to make to successfully teach this unit?

_____

_____

Write Additional Comments on Back.

Return the completed form to the SACAI project:

AISES
1630 30th St., Suite 301
Boulder, CO 80301

Post Assessment - Student
How Does Alcohol Circulate through the Body and Community?

Grade: _____

Circle the number that tells how you feel about each item.

1 = strongly disagree
2 = disagree
3 = agree
4 = strongly agree

1. The community members helped me to understand the problems with alcohol.

   1 2 3 4

2. I have a better understanding of how alcohol affects my body.

   1 2 3 4

3. I liked the activities in SACAI.

   1 2 3 4

4. I think other students my age should study SACAI.

   1 2 3 4

5. What I like best about SACAI is: _____

   _____

6. What I like least about SACAI is: _____

   _____

Return the completed form to the SACAI project:

AISES
1630 30th St., Suite 301
Boulder, CO 80301

How Does Alcohol Circulate through the Body and Community?

Holistic Statement: The circulatory system delivers food, oxygen, and other vital substances to more than 100 trillion cells in the human body. This great "river of life" also removes toxins and wastes from the body's cells, helping them remain healthy. When alcohol enters the bloodstream, it rapidly travels throughout the body and easily enters heart cells, brain cells, nerve cells, muscle cells, liver cells - all cells. Just as pollution poisons a lake or river that supports a community, alcohol disrupts the community of cells whose life depends on the circulating river of blood. Even one swallow of alcohol finds its way into the bloodstream. The more alcohol ingested into the body, and the longer the drinking lasts, the greater will be the damage to the physical, spiritual, emotional, and mental life of the drinker. Eventually, the pollution which damages the alcohol drinker also hurts the family, friends, and community.

Unit Goal: The purpose of this unit is to study how alcohol circulates throughout one's body and community. (Class time for completion of unit: 8 class periods)

Unit Outcomes: The students will:

- define blood alcohol level
- identify the major components of blood
- demonstrate and explain the process of diffusion of alcohol in the blood
- describe the capillaries' functions
- describe ways alcohol travels through a community and affects every member in the community
- describe purposes and functions of a community

Unit Assessment: The post unit assessment and the unit activities are designed to provide ongoing assessment as students complete the tasks and associated response forms.

Interdisciplinary Connections: This curriculum emphasizes the application of interdisciplinary skills and knowledge in the study of the science of alcohol. This includes use of the following in integrative ways: critical thinking, problem solving, reading, writing, math, and community learning.

Journal: The journal is to be used as a problem-solving tool for students and teachers as they reflect on what they learn and set down their feelings in words. Writing in the journal serves as a way to clarify thoughts, feelings, and learning and should be shared with others at the discretion of the writer. Sharing of journal entries by both students and teachers enhances the concept of community. Journal entries may be made at any time throughout the unit. However, some of the suggested times are indicated in the unit by the symbol .

SACAI Sharing Box: SACAI and related topics are sensitive issues; students may have trouble speaking out in class about their concerns. Using a sharing box allows the students to voice their concerns or questions in an anonymous non-threatening way. Students may ask any questions or make any statement they wish about alcohol and their lives through the sharing box. Set aside class times to discuss sharing box items and seek the assistance of community members for responses to items you do not know.

Content Summary

Science Background Summary for the Teacher

The human circulatory system has three major components: 1) the blood, 2) the heart, and 3) the blood vessels. The purpose of the circulatory system is to nourish and cleanse all the cells in the body. There are about 70 trillion (70,000,000,000,000) cells in the body, and the total length of the blood vessels in the human body is about 60,000 miles (about 96,000 km), which is about a quarter of the distance from the earth to the moon.

Each part of the circulatory system has a specific function:

The blood regulates the body's internal environment. Blood brings oxygen and nutrients to the cells and carries away carbon dioxide and other wastes produced by the cells. Substances such as alcohol and drugs are also transported to the cells by the blood.

The heart pumps blood into the blood vessels and provides the push to send it through all the blood vessels of the body and back to the heart.

The blood vessels carry the blood throughout the body. Except in cases of injury or disease, the blood is always carried inside the blood vessels as it travels through the body.

Three types of blood vessels are found in all parts of the body:

Arteries carry blood away from the heart.

Veins carry blood towards the heart.

Capillaries connect arteries and veins. They bring oxygen and nutrients to the body's cells. They also transport harmful substances, including alcohol, into and out of the cells.

The major artery (the aorta) leaves the heart and branches into smaller and smaller arteries. The smallest arteries connect with masses of tiny capillaries, and the other end of the capillaries connect with the smallest veins. The smallest veins join to form bigger and bigger veins that return the blood to the heart. The largest artery and the largest veins are about an inch (2.5 cm) in diameter, but the capillaries are smaller in diameter than the point of a straight pin. Capillaries are so small that red blood cells must pass through them in single file and must bend and twist to get through. It is in the capillaries that oxygen, nutrients, hormones, minerals, and other substances, such as alcohol, pass from the blood into the body cells. It is also in the capillaries where carbon dioxide and cell wastes pass from the cells into the blood to be carried away. The process of transfer between the blood and the cells occurs by diffusion, the spreading out of substances from higher to lower concentration. Diffusion moves substances from the blood into the cells and from the cells into the blood. Diffusion works well because each cell in the body is no further than one-millionth of an inch (1/1,000,000 in.) from a capillary and because the capillary walls are only one-cell thick.

Alcohol Information Summary for the Teacher

Alcohol mixes easily with water. Because half of the volume of our blood is made up of water, alcohol mixes easily with blood. The blood carries the alcohol to every cell in the body, just as it carries oxygen and nutrients to the cells. Alcohol enters the bloodstream by diffusion into capillaries in the walls of the mouth, stomach, and intestines. Relatively small amounts of alcohol are absorbed through the mouth, but as much as a fifth of the alcohol that reaches the stomach is transferred directly into the blood through the capillaries in the walls of the stomach. The alcohol that remains in the stomach passes into the intestines where it is absorbed more rapidly than food particles into the bloodstream. Once in the blood, alcohol is rapidly distributed throughout the body by the circulatory system. The level or percentage of alcohol in the blood is referred to as blood alcohol level. This is measured to determine whether someone is driving under the influence (DUI) of alcohol or driving while intoxicated (DWI).

When a person drinks, it takes only minutes until alcohol reaches tissues and organs throughout the body. As long as alcohol remains in the blood, all the cells of the body are exposed to its effects because the blood tries to "even out" the internal environment by transporting the alcohol to all of the body's cells. The diffusion that occurs in response to alcohol causes the cells to become dehydrated. Alcohol in the cells also inhibits the production of energy, interferes with the structure of the cell membranes, and generally slows down the cells' ability to function. Research indicates that irritation due to alcohol can even result in cancer.

The Trail of Beauty

by Kevin Shendo (Walatowa - Pueblo of Jemez)

It was a warm summer morning and all that could be heard was the sound of birds chirping in the deep canyons of Black Bear Valley. This valley was the home of White Swan's people. Every day White Swan would get up early and sit in front of her home to greet the sun as it rose from behind the great eastern mountains. White Swan was a lovely young girl who loved walking along the river and up in the rolling hills of the valley.

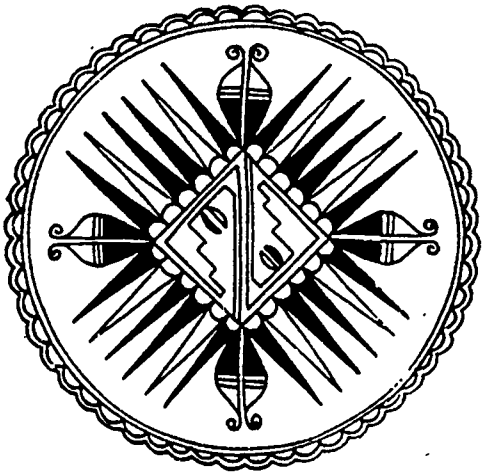
White Swan and her mother Whistling Beauty were very close and did everything together. Whistling Beauty taught White Swan all that her mother had taught her about life, nature and survival. As White Swan grew older, she learned more about herself and her relationship with everything around her. She understood the reasons behind the teachings, songs and prayers of her people. She earned respect from the people of her tribe by upholding their traditional values and setting an example for the children.

White Swan enjoyed singing the songs learned from her mother. She would sing all day as she and her mother worked, especially when they walked along the river gathering reeds to use in weaving baskets.

Although the whole village loved White Swan, some youths her age were jealous of all the attention that she received. One day White Swan decided to go down to the river to bathe. As she watched the river flow, she was reminded how important it was to the survival of her people. The elders had taught them that water was the strength that carried life to all beings on this earth, so this river was highly respected by her people.

White Swan began to sing a song for the river. The youths who were jealous of her heard her and became angry. They looked to see how far down stream White Swan was from them. When they saw her getting into the river to bathe, they poured some witch water into it. White Swan was still singing as she cleansed herself when the witch water reached her. She poured it all over herself, and took a big drink. When she got out of the river, she felt a little weak. White Swan began to stumble and lost control of her body.

The witch water had gotten into her bloodstream and traveled, as a river, to all parts of her body. White Swan couldn't figure out what was happening to her. She fell but did not feel anything. The witch water made its way to her brain and affected her thinking and attitude toward life. What she once held as sacred teachings were suddenly no longer important to her. She was angry with Nature and blamed it for her misfortune. Life was no longer joyful, but a burden. She even wished for death to come and take her



away from her troubles, family, and friends. Giving in to these negative thoughts, White Swan lay down at the river's edge and looked up into the sky, which seemed to spin uncontrollably. In the meantime her family was wondering where she was, so they sent her brother, Spotted Eagle, to go look for her. As he searched, he yelled out his sister's name, but she didn't answer. He was getting worried and so he went further down along the river. In the distance he could hear her weakened voice as it was carried by the wind. White Swan was still lying on the river's edge. Her anger had turned to sadness and depression. Her eyes were filled with tears when Spotted Eagle found her. He picked her up and carried her down the hill to their home. As Spotted Eagle walked, he could see the effect that the witch water had on his sister and this made him sad. When they got to the village they were met by their parents, who took White Swan into their house and laid her down.

They sent Spotted Eagle to get a medicine man in hopes of healing White Swan. But when the medicine man got to their home he could tell that she had been exposed to too large a dose of the witch water. It was too late to save White Swan. After he prayed, sang, and used his medicines on her for four days, she opened her eyes and thanked the medicine man for coming. She turned to her family who were sitting around her and told them she had been given several messages to pass on, the most important of which was that the ways of their people were strong and true. To protect future generations of children, her family was to work with other tribal members to uphold their traditions, and protect and guide these children on the right path. After sharing her messages, she closed her eyes and went to join former members of her tribe who had walked the true spiritual path, the Trail of Beauty.

It is said by the people of Black Bear Valley that White Swan's presence continues to be felt, looking out for the children and youth of her tribe. They say her voice can be heard as it is carried by the wind, and that her image can be seen in her beloved river. She continues to remind tribal members to hold to their values and traditional ways, so they will have the strength to combat witch water and to follow the Trail of Beauty at the end of their days.

CRITICAL CONCEPTS:

Prior to beginning this unit, students must have mastery of or familiarity with the following concepts and skills:

1. *arteries - definition; function and location in the body*
2. *veins - definition; function and location in the body*
3. *capillaries - definition; function and location in the body*
4. *measurement*
5. *interviewing people*
6. *working in a cooperative group*
7. *journal writing*

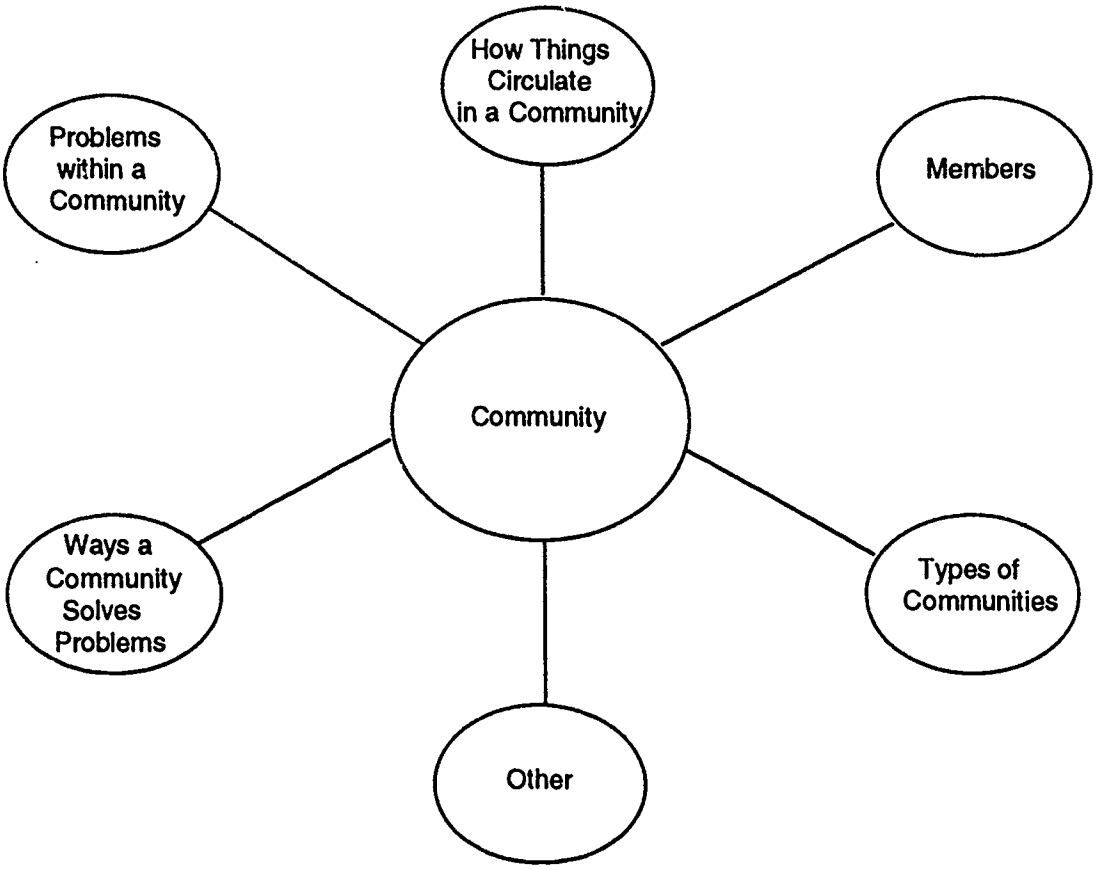
TEACHER PREPARATION: *Display the Circulatory System poster where it can be referred to throughout the lesson. Gather the materials needed for each activity and duplicate the response forms.*

When involving community members in this curriculum, and you are unfamiliar with the local community, it is important to consult with a long term community member to help you identify possible participants. This community member may be able to ask the guests on your behalf. Community members could be any of the following: community health representatives, school faculty, school support staff, or tribal government officials.

For Activity 3: "How Does Alcohol Get Into Cells?", mix 500 ml of colored water for each pair of students. Cut dialysis tubing into 6-inch strips. Soak pre-cut dialysis tubing in a container of water for at least 20 minutes prior to beginning the activity. Use the directions found in Activity 3 to prepare a control group. Fill one tube with clear water and place it in a cup of clear water. Fill another with colored water and place it in a cup of colored water.

A. COMMUNITY AND SCIENCE KNOWLEDGE

1. Begin the unit by placing the following visual on the board or chart paper. Students brainstorm ideas related to the topic of community. Record these responses.



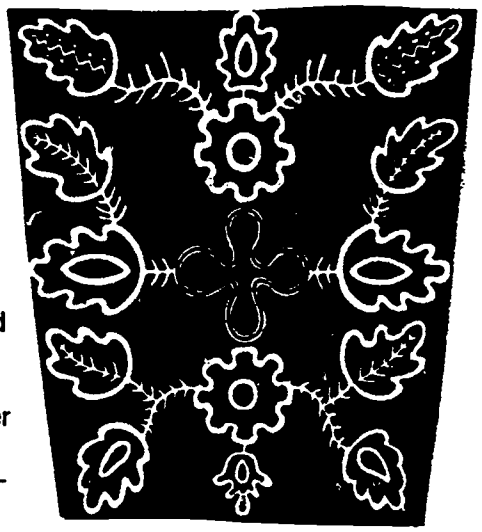
2. Inform students that some community members will be involved in helping them study this unit. Using ideas generated in the above activity, help students generate questions which they want to ask community members about their community.

3. Break students into groups of four to generate specific questions.

4. Help students clarify questions. Questions are copied and given to students.

5. Provide students the opportunity to ask community members their questions. (This may include bringing community members into the classroom, having students go out in the community, discussing these questions with family members or significant others.) Students document their responses.

6. Ask students to share their findings. This includes:
   - What questions they asked the community members?
   - Who they talked to and why?
   - What they learned about their community?
   - How is this information useful?



B. THE STORY

1. Identify a community member to share the story, "The Trail of Beauty". The story should be adapted to fit the students' culture and community.

2. Present the story with the following question for students to consider as the story is being presented:
   - How can the effect of White Swan's illness on the family and community be compared to the effect of alcohol in your community?

3. After presentation of the story, students retell or respond to the story in creative ways including murals, role playing, creative writing, etc.

C. DETERMINING BACKGROUND KNOWLEDGE

Prior to beginning the activities, ask the following questions:

1. What do you know about arteries, veins, capillaries in the circulatory system?
2. What do you know about diffusion?
3. What do you know about the composition of blood?
4. What do you know about alcohol as it circulates through the body?

Record the students' responses on a chart or chalkboard. Provide time for students to add or change information to the chart throughout the unit.

D. ACTIVITIES

Materials for each activity provide for one pair of students.

Activity 1:
Does Alcohol Mix With Blood?

2 droppers
3 clear plastic cups
1 graduated cylinder

Activity 2:
How Is Alcohol Delivered to Every Cell?

1 - 5" piece of red yarn
1 - 5" piece of blue yarn
Glue
One sheet of blank paper

Activity 3:
How Does Alcohol Get Into Cells?

2 - 6" strips dialysis tubing (prepared by the teacher)
1 dropper
500 ml of colored water
2 - 6" strips dialysis tubing (soaking in water)
2 clear plastic cups
6" pieces of thread
Masking tape

Activity 4:
Blood Alcohol Level: Why Do Small Numbers Mean A Lot?

1 driving manual for your state

Group students in pairs and work with them as they complete Activities 1 through 4. Each pair completes one response form per activity.

E. WHOLE CLASS ACTIVITY

Ask a student to stand in the middle of the room. Pour a strong smelling cleaning solution or perfume on a cotton ball and have the student hold it above his head. Have students raise their hands when they smell the aroma. *(The students closest to you should raise their hands first. As the solution diffuses throughout the room, students farther and farther away should raise their hands.)* Ask students to explain what happened. (Diffusion occurs when molecules move from a higher to lower concentration.)

F. SMALL GROUP FOLLOW-UP

Divide the class into groups of four (identical to the groupings done at the beginning of the unit in Community and Science Knowledge.) Provide each group with one copy of "How Does Alcohol Circulate through the Body and Community? Review." Provide time for the students to discuss the answers within their group. After a specified amount of time, discuss group responses with the class (e.g., have group recorder share group responses.) Repeat the process with the remaining questions.

G. SHARING SESSION

Students share what they have learned about how alcohol circulates through a body and its effects on the community. Audiences may consist of other classmates, primary age students and/or community members.

H. UNIT REVIEW ACTIVITIES: Select one or more of the following to reinforce concepts explored in the unit.

1. Divide the class into groups of four. Each group member takes a 5"x7" card and writes a "Q" in the upper left hand corner of the front side of the card, and an "A" in the upper left hand corner on the back. Then each student writes a review question from this lesson on the "Q" side of the card. The author asks the group the question. When there is consensus, the author writes the answer on the "A" side of the card. If consensus cannot be achieved, the question is revised. Then the next student becomes the author and the process continues until each student has a completed 5"x7" card.

Groups pass their stack of review cards to another team. Each group responds to the cards by having a student read the first question. The group attempts to answer it. If they have consensus, they turn the card over to see if they agreed with the sending group. If not, they write their answer as an alternative. The next student reads the second card and the procedure is repeated.

Upon return of the cards to the original group, there is opportunity to discuss and clarify differences or questions.

2. Have students work with a partner or in small groups to answer or illustrate three of the following:

   a. Explain how the circulatory system delivers alcohol to all parts of the body.
   b. Why are capillaries so important in delivering alcohol to every cell in the body?
   c. Explain the process of diffusion.
   d. What are the major components of blood?
   e. What are the dangers of high blood alcohol levels?
   f. Explain how alcohol travels in a community and affects its' members.

3. Ask students to work in small groups to answer the question, "What have we learned about how alcohol circulates through a body and community?" Add responses to the chart from the beginning of this lesson. Use this to review the concepts addressed in the unit.

I. **POST ASSESSMENT:** Each individual student completes the following task:

In your own creative way show what you have learned about how alcohol circulates through the body and community.

See "Ways to Share Information" page for ideas.

SAFETY TIPS:	*Rubbing alcohol is poisonous and should not be swallowed. All of the substances should be handled with care.*
Clean Up:	*Encourage students to make the best possible use of the Creator's gifts by recycling whenever possible.*
VOCABULARY:	
Alcohol:	*A drug found in beer, wine and hard liquor that moves quickly into the circulatory system and travels with the blood.*
Blood Alcohol Level:	*The amount of alcohol present in a person's blood.*
Capillary:	*The tiniest blood vessels that connect arteries and veins. Capillaries bring oxygen and nutrients to the body's cells and carry away wastes.*
Nutrients:	*A usable portion of food.*
Oxygen:	*A gas needed by cells to live.*

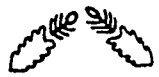
Ways to Share Information

block picture story

play

word search

mobile



flannel board story

photograph

sculpture

skit

rebus story

illustrated story

triangle poem

radio program

advertisement

interview

book jacket

graph

puppet show

transparency

letter to the editor

scrapbook

filmstrip

triplet

riddle

picture dictionary

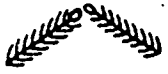
game

collection

newspaper article

poem

booklet



survey

journal

labeled diagram

vocabulary list

prayer

chart

map

jigsaw puzzle

greeting card

poster

fact file

demonstration

collage

tapes

diorama

23

Activity 1: Does Alcohol Mix with Blood?

Names _____

1. Gather the following materials:
   3 clear plastic cups — 1/4 cup of oil
   1 graduated cylinder — 1/4 cup of alcohol
   2 droppers — food coloring

2. Complete the chart by predicting which liquids you think will spread out (diffuse) with water.

Predictions	Will Diffuse	Will Not Diffuse
Food coloring		
Oil		
Alcohol		

3. Use the graduated cylinder to put 50 ml of water in each of the three cups.

4. Drop four drops of food coloring into one of the cups of water and observe what happens when the two liquids meet.

5. Record your observations in the chart below.

Observations

Food coloring	Oil	Alcohol

6. Drop four drops of oil into another cup of water and observe what happens. Record the results in the chart in Item 5.

7. Drop four drops of alcohol into the third cup of water. Record your observations in the chart.

8. How did your predictions from Item 2 compare with what you observed in Item 5?

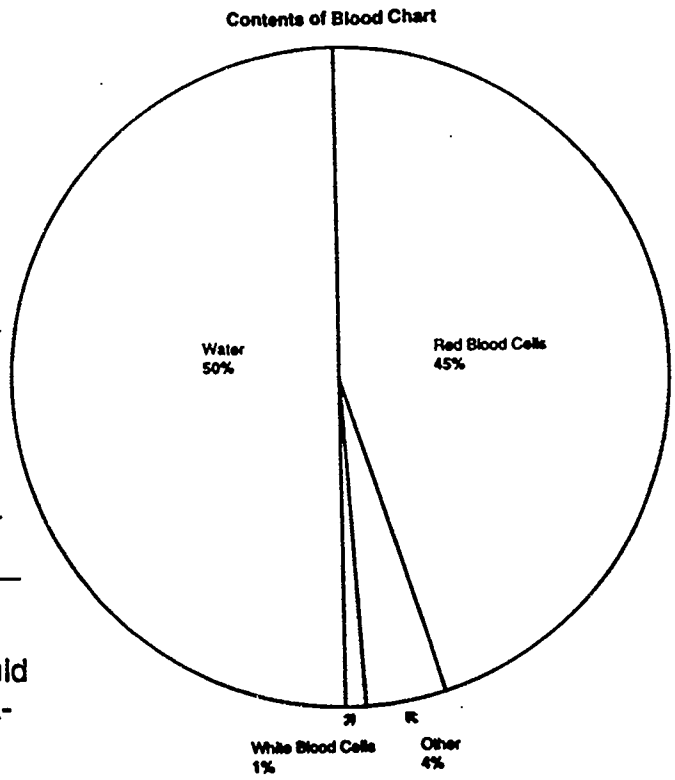
9. Write a definition for "diffusion" in your own words:

10. Which liquid spread (diffused) the easiest throughout the water? _____

11. What is the percentage of water in your blood? (use the Contents of Blood Chart)

12. If alcohol diffused easily with water, why would it mix easily with blood?

13. Blood circulates quickly in the body. How would this affect the way alcohol travels in the circulatory system?



14. Describe ways in which alcohol spreads (diffuses) through your community.

Activity 2: How Is Alcohol Transported to Every Cell?

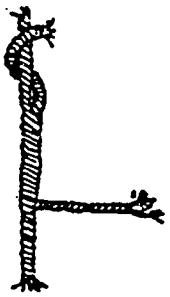
Names _____

Work with your partner to complete a Blood Vessel Model.

1. Gather the following materials:
   1 piece of blue yarn glue
   1 piece of red yarn one sheet of white paper

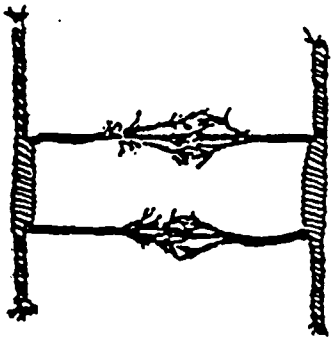
2. Separate 1/4 of the way one of the 3 strands that make up the piece of red yarn.

3. Unwind the end of this small strand into thinner and thinner strands.



4. Repeat this procedure with another strand from the opposite end of the same piece of yarn.

5. Complete steps 2-4 with a piece of blue yarn.



6. Glue both pieces of yarn to a sheet of blank paper. Make sure the ends of the thinnest strands of the red yarn touch the ends of the thinnest strands of the blue yarn. (Keep in mind that the circulatory system is completely closed with no breaks between arteries and veins.)

Work with your partner, using existing classroom science materials, to help complete the following:

7. Label the Blood Vessel Model with these terms:

   artery
   vein
   capillaries

8. What substances are delivered to the cells through the capillaries?

_____

_____

9. What substances are carried away from the cells by the capillaries?

_____

_____

10. How does a capillary's size and thickness compare to that of arteries and veins? How does this help a capillary do its job?

_____

_____

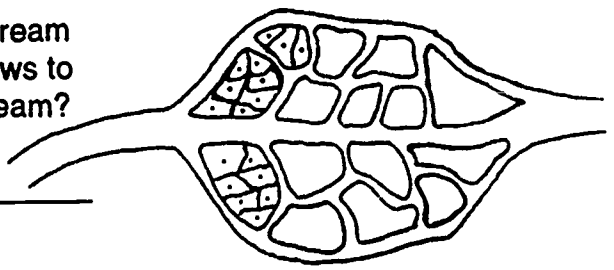
11. Why is it important for every cell in the body to be located near a capillary?

_____

_____

12. Draw several cells within the Blood Vessel Model. Using arrows, label what enters and exits a cell.

13. If a person drinks alcohol, it enters the bloodstream very quickly. What is the pathway alcohol follows to enter the body's cells once it is in the bloodstream?



_____

_____

14. Add alcohol to your model. Use arrows to label the direction it would travel.

15. Cells need to be near capillaries to survive. What do communities need to be near in order to survive?

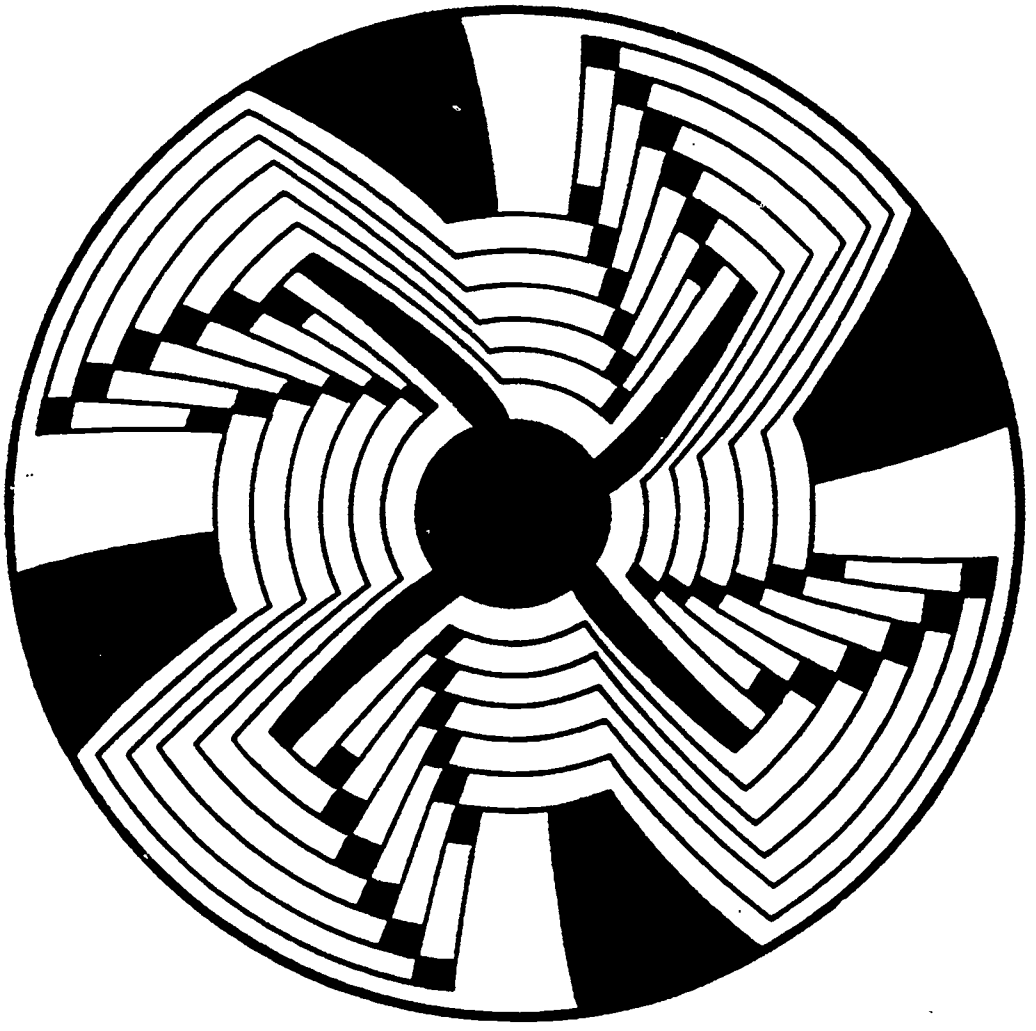
_____

_____

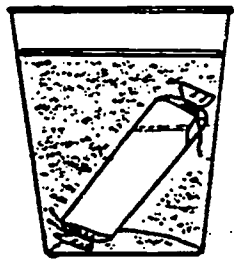
16. Alcohol is a poison - both to cells and the community. What can your community do to get rid of the poison of alcohol?

_____

_____



6. Place this tube in a container labeled "Sample 1: inside clear, outside colored" on a piece of masking tape and fill the container with the colored solution just until the tube is covered.



7. Use the same procedure to fill a tube with colored water. Place this tube in a cup of clear water labeled "Sample 2: inside colored, outside clear."

8. Fill out the chart below with your beginning observations.

	Beginning Observations		**Observations After 24 Hours**	
	Liquid Inside Tube	Liquid Outside Tube	Liquid Inside Tube	Liquid Outside Tube
Sample 1				
Sample 2				

9. Predict what you think might happen in 24 hours to the liquids in the plastic cups.

Sample 1 _____

Sample 2 _____

10. The results of this demonstration will be observable in 24 hours.

11. After 24 hours fill out the rest of the chart in Item 8.

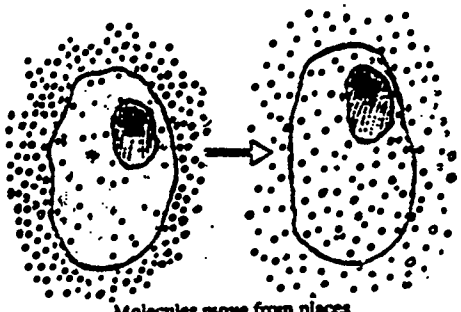
12. Explain how the results compared with your predictions.

13. What do you think happened to Sample 1 and Sample 2?

14. At the start of Sample 1, where was the highest concentration (larger amount) of food coloring? _____

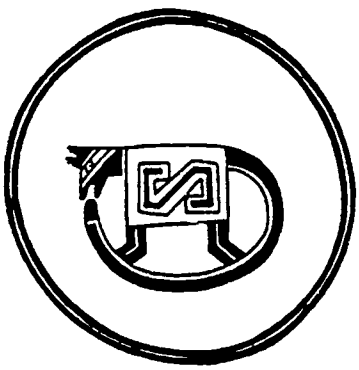
    the lowest concentration of food coloring? _____

15. In what direction did the food coloring move (diffuse)? This movement is called diffusion. Explain why the food coloring moved in the direction it did.



Molecules move from places where they are more concentrated to places where they are less concentrated.

16. The tube is like a cell; it lets some substances in and some substances out by diffusion. Why do cells need to let some substances enter and some leave the cell?



17. If alcohol were added to the water in the cup, what do you think would happen? Why?

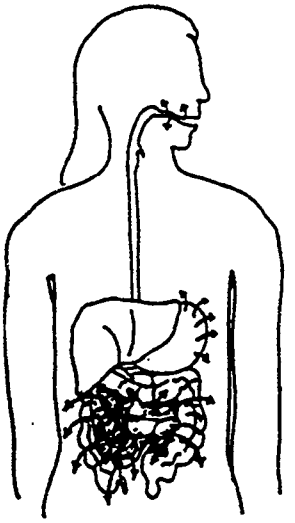
18. When alcohol is in a person's blood, what do you think happens?

19. In this experiment, one substance diffused into the tube while another substance diffused out. If alcohol diffused into your community, what would diffuse out?

Activity 4: Blood Alcohol Level: Why Do Small Numbers Mean A Lot?

Names _____

1. When a person drinks alcohol, it passes directly from the digestive system into the circulatory system. Look at the drawing to determine where alcohol enters the circulatory system.



2. Blood alcohol level is measured to determine a person's level of intoxication. What do you think blood alcohol level is?

3. Blood alcohol level is the amount of alcohol present in the blood. It is usually expressed in a percent. Use the Blood Alcohol Level Chart to answer the following questions.

4. Describe how .1% of alcohol present in the blood would affect a body.

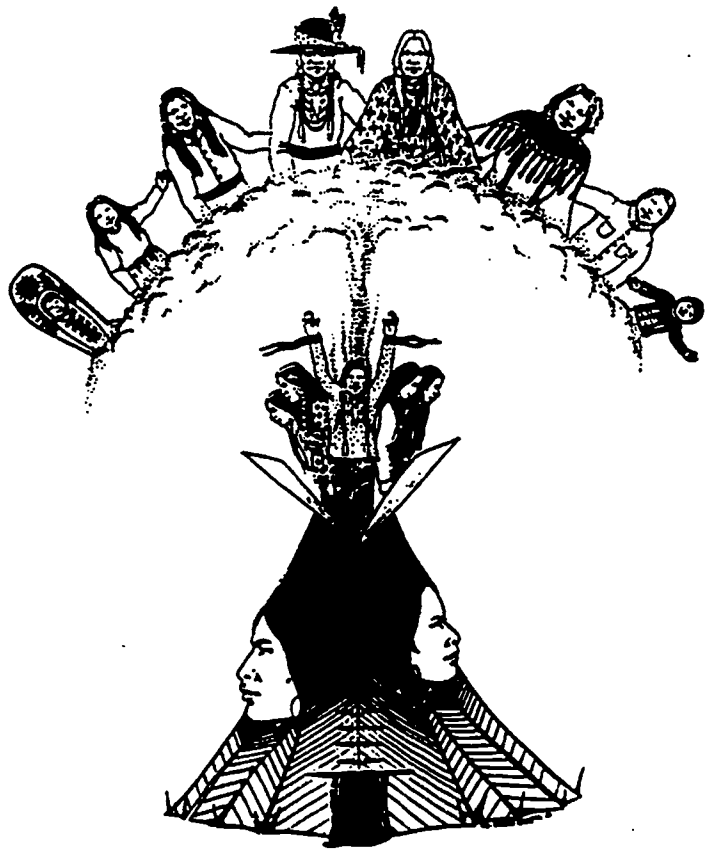
5. What is the blood alcohol level at which alcohol blocks the brain's ability to control breathing and heart beat?

6. Describe the changes alcohol causes when a person has a blood alcohol level (BAL) of .05%.

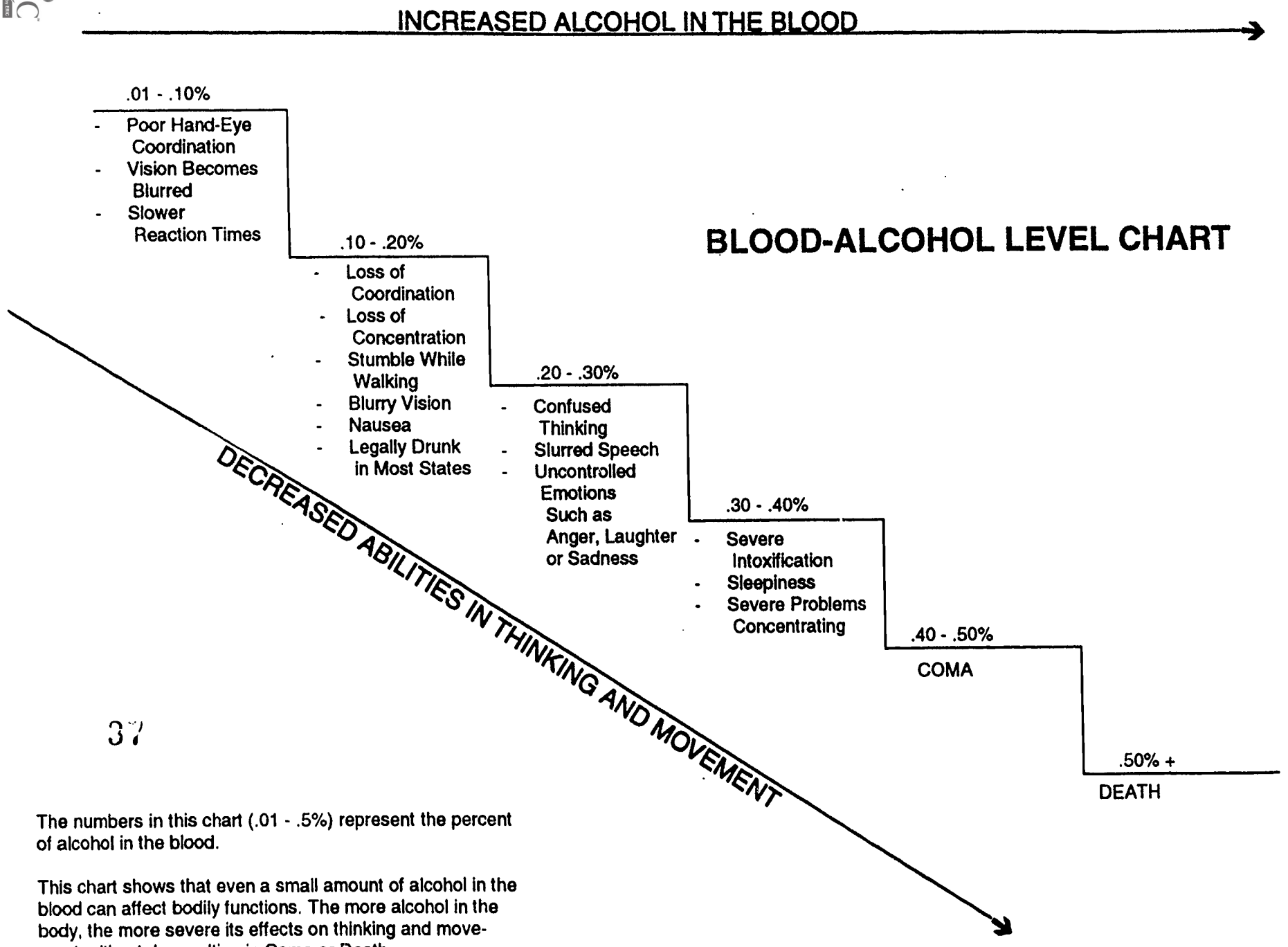
7. In your state, when is a person considered legally intoxicated? (Use the state driving manual.)

8. At what blood alcohol level do you think a person should be considered intoxicated? Why? Compare this to your state's legal guidelines.

9. What community activities would be difficult to do with a blood alcohol level of .2%?



BLOOD-ALCOHOL LEVEL CHART



37

The numbers in this chart (.01 - .5%) represent the percent of alcohol in the blood.

This chart shows that even a small amount of alcohol in the blood can affect bodily functions. The more alcohol in the body, the more severe its effects on thinking and movement, ultimately resulting in Coma or Death.

How Does Alcohol Circulate through the Body and Community?
Review

Names _____ _____

_____ _____

Discuss the answers to these questions as a group. Each group selects a recorder to record the final responses.

1. Explain how capillaries, veins and arteries work together in the body.

_____

_____

2. Why is diffusion in the circulatory system necessary for the survival of the body?

_____

_____

3. Why does alcohol diffuse so easily in the blood?

_____

_____

4. Where in the circulatory system does diffusion take place? Why does it occur there?

_____

_____

5. Explain how alcohol reaches body cells.

6. What are the dangers of having a high blood alcohol level?

7. What can you do to protect yourself and your community from alcohol?

How Does Alcohol Circulate through the Body and Community? Answer Form

Activity 1: Does Alcohol Mix with Blood?

2. Answers will vary.

5. Food Coloring: (diffuses at a slower rate)
   Oil: (does not diffuse)
   Alcohol: (diffuses almost instantly)

Activity 2: How Is Alcohol Transported to Every Cell?

7. artery: (from the heart)
   vein: (to the heart)

8. (O_2 and nutrients)

9. (CO_2 and waste)

10. (smaller/thinner) (It allows substances to diffuse in and out.)

11. (Every cell is nourished by a capillary.)

13. (Alcohol is delivered to the body cells by the capillaries.)

15. (hospitals, grocery stores, gas stations, schools, etc.)

16. (education, rehabilitation, support drug-free activities, etc.)

Activity 3: How Does Alcohol Get Into Cells?

8.

Sample One: (clear)	(colored)	(colored)	(colored)
Sample Two: (colored)	(clear)	(colored)	(colored)

9. (Answers will vary.)

12. (Answers will vary.)

13. (Answers will vary.)

14. (outside the tube) (in the tube)

15. (The food coloring moved from an area of high concentration to an area of low concentration.)

16. (In order to survive, cells let needed substances in while other substances are removed.)

17. (Alcohol would diffuse into the tube. Alcohol would diffuse from a higher concentration to a lower concentration.)

18. (Alcohol diffuses into cells along with O_2 and nutrients.)

19. (community values, health, happiness, and responsibilities.)

Activity 4: Blood Alcohol Level: Why Do Small Numbers Mean a Lot?

1. (Alcohol enters the bloodstream through the capillaries in the mouth, stomach, and small intestine.)
2. (Answers will vary.)
4. (Motor functions like walking, hand/eye coordination, and reaction time are affected.)
5. (.4%)
6. (Alcohol affects a person's judgement, vision, reflexes, and the ability to concentrate.)
7. (This varies from state to state.)
8. (Answers may vary.)
9. (Participating in a pow wow, sporting event, or school function)

How Does Alcohol Circulate through the Body and Community? Review

1. (Arteries carry blood away from the heart and veins carry blood to the heart. Capillaries connect arteries and veins. Capillaries bring oxygen and nutrients to the body's cells and carry away wastes.)
2. (Oxygen and nutrients diffuse into the cells. Wastes diffuse out of the cells into the blood. Without nutrients, oxygen or with a build up of wastes, the cells would die.)
3. (Alcohol mixes very easily with water, and blood is 50% water.)
4. (Diffusion occurs in the capillaries because the capillaries are very thin.)
5. (Alcohol mixes easily with blood and diffuses through capillary walls to every cell in the body.)
6. (driving accidents, inability to function, coma or death)
7. (Identify community members you can talk with, education, traditional values, advertise and support drug-free activities and events.)

How Does Alcohol Deprive the Body and Community of Energy?

An Interdisciplinary Approach to the Study of the Science of Alcohol for Upper Elementary and Middle Level Students

SACAI Unit Two

American Indian Science and Engineering Society
1630 30th Street, Suite 301
Boulder, CO 80301

Post Assessment - Teacher
How Does Alcohol Deprive the Body and Community of Energy?

Teacher: _____

School/State: _____ _____

Grade Level(s): _____

Percent American Indian in School/Tribe(s): _____ _____

Number of Classes/Students: _____ _____

1. In what ways did the community members help the students in understanding the problem of alcohol in the community?

_____

_____

2. In what specific ways did the curriculum challenge the students to use their critical thinking and problem solving skills?

_____

_____

3. How did the students demonstrate creativity in completing the Post Unit Assessment Activity?

_____

_____

4. What instructional adaptations did you have to make to successfully teach this unit?

_____

_____

Write Additional Comments on Back.

Return the completed form to the SACAI project:

AISES
1630 30th St., Suite 301
Boulder, CO 80301

Post Assessment - Student
How Does Alcohol Deprive the Body and Community of Energy?

Grade: _____

Circle the number that tells how you feel about each item.

1 = strongly disagree
2 = disagree
3 = agree
4 = strongly agree

1. The community members helped me to understand the problems with alcohol.

   1 2 3 4

2. I have a better understanding of how alcohol affects my body.

   1 2 3 4

3. I liked the activities in SACAI.

   1 2 3 4

4. I think other students my age should study SACAI.

   1 2 3 4

5. What I like best about SACAI is: _____

   _____

6. What I like least about SACAI is: _____

   _____

Return the completed form to the SACAI project:

AISES
1630 30th St., Suite 301
Boulder, CO 80301

How Does Alcohol Deprive the Body and Community of Energy?

Holistic Statement: The digestive system consists of integrated organs, each of which contributes to changing food into a form that our bodies' cells can use. When alcohol enters the digestive system, it interferes with the process of digestion. Alcohol's effects can be temporary or permanent; nonetheless, the body's normal healthy functioning is always altered at some level by the presence of alcohol. The digestive organs, like a Medicine Person and a community, work together to maintain balance and health in each organ and in the body as a whole.

Unit Goal: The purpose of this unit is to study how alcohol deprives the body and community of necessary "nutrients" preventing the maintenance of a healthy state.

Unit Outcomes: The students will:

- describe the short- and long-term effects of alcohol on the stomach, small intestine, and liver;
- describe the purpose and function of a community;
- identify activities which take place in communities and how alcohol interferes with these activities; and
- demonstrate the similarities between how alcohol deprives a body and community of energy.

Unit Assessment: The post unit assessment and the unit activities are designed to provide ongoing assessment as students complete the tasks and associated response forms.

Interdisciplinary Connections: This curriculum emphasizes the application of interdisciplinary skills and knowledge in the study of the science of alcohol and community. This includes use of the following skills in integrative ways: critical thinking, problem solving, reading, writing, mathematics, and community learning.

Journal: The journal is to be used as a problem-solving tool for students and teachers as they reflect on what they learn and set down their feelings in words. Writing in the journal serves as a way to clarify thoughts, feelings, and learning and should be shared with others at the discretion of the writer. Sharing of journal entries by both students and teachers enhances the concept of community. Journal entries may be made at any time throughout the unit. However, some of the suggested times are indicated in the unit by the symbol 📖.

SACAI Sharing Box: SACAI and related topics are sensitive issues; students may have trouble speaking out in class about their concerns. Using a sharing box allows the students to voice their concerns or questions in an anonymous non-threatening way. Students may ask any questions or make any statement they wish about alcohol and their lives through the sharing box. Set aside class times to discuss and seek the assistance of community members for answers to questions you do not know.

Content Summary

Science Background Summary for Teacher

The human body changes the foods we eat into substances that we need for growth, energy and life. The mechanical breakdown of food begins in the mouth with chewing. The chemical breakdown begins with the secretion of saliva. The mashed food moves down the esophagus and into the stomach. Here, both mechanical muscular action and chemical enzyme action continue until the food, now referred to as chyme, has an oatmeal-like consistency. Few nutrients are absorbed into the blood through the stomach.

Absorption occurs primarily in the small intestine. Finger-like projections, called the villi, line the small intestine and give it its velvety texture. This design increases the surface area of the intestine. Nutrients are absorbed by the cells that line the villi. From there, they move into the bloodstream. Muscular action in the small intestine helps mix chyme with digestive enzymes and bile.

Bile is produced by the liver and stored in the gall bladder. It is released into the small intestine through the common bile duct. Bile helps the process of digestion in the small intestine. It decreases the surface tension of fatty acids so that they break into smaller components. Here digestive enzymes are also added to the food particles in the small intestine from the pancreas.

Once the food passes through the small intestine, it has little left in it of value except for water and a few vitamins that are absorbed in the large intestine. The waste that is left is expelled through the anus.

Alcohol Information Summary for the Teacher

Alcohol is readily absorbed from the digestive system into the bloodstream. Twenty percent is absorbed through the stomach walls. The remaining alcohol is absorbed into the bloodstream through the walls of the small intestine. The alcohol molecule is small enough that it does not need to be broken down (metabolized) in order to be absorbed directly into the bloodstream.

Alcohol has both short-and long-term effects on the digestive system. In the stomach, muscular action is slowed. In the small intestine, a short-term consequence of alcohol is that the villi lay flat. These effects, combined with a decrease in enzyme activity as a result of alcohol consumption, lead to a malabsorption of nutrients. In combination with this impairment in absorption, and because people consuming alcohol on a regular basis often do not get enough of their calories from food (they get them from alcohol instead), chronic use can lead to malnutrition.

Long-term use of alcohol aggravates existing ulcers by increasing the acid production which harms the stomach lining. Ulcers can lead to internal bleeding and the release of undigested food particles and stomach acid into the body cavity. A long-term effect is duodenal ulcers (ulcers in the first part of the small intestine) that form in much the same way as stomach ulcers. Pancreatitis, which produces acute abdominal pain, is also caused by alcohol. In the large intestine, alcohol's sedating effect slows the absorption of water and the remaining vitamins. This can result in diarrhea and further vitamin deficiency.

Alcohol not only affects the organs in the "food tube", but the accessory organs as well. The liver is especially impacted. The liver has about 500 different jobs - including producing bile, metabolizing nutrients and breaking down toxins. Alcohol's presence in the blood requires the liver's attention (to metabolize the alcohol into nontoxic elements), which impairs the liver's ability to do its other jobs. Cirrhosis of the liver is the leading cause of death among alcoholics, and the ninth leading cause of death in the U.S. Cirrhosis means "scarring." Scar tissue develops as liver cells die from not producing enough energy to nourish themselves and from the damage of the poisonous by-products of alcohol. The scar tissue does not do any of the work of the liver cells. The scars also constrict, cutting off the blood supply to liver cells - thus killing more of the liver. Cirrhosis eventually causes death because the liver can no longer serve the body and the body cannot survive without it. Unfortunately, cirrhosis is one of the consequences of alcohol use that is not reversible with abstinence.

Several transparencies are provided for use with students should you wish to discuss the above content with the class.

The Medicine Person and the Beast

adapted from a story by Carolyna Smiley-Marquez (San Juan Pueblo)

This is a story about a Beast who visits the people of the tribe, knocking on their doors and wearing an untrue but beautiful face. It speaks with a smooth, musical voice, and covers its own smell with the clean scents of the forest. If the people allow it to enter their homes, the Beast promises to bring peace and happiness to them. At first the Beast is very friendly, and as the house fills with talking and laughter, the family learns to trust it.

As time goes on, the Beast begins to show its true, beastly face. It roars around the house, bumping, pushing, shoving, and knocking family members around. It becomes so crazy it even tears at itself with its own claws, making terrifying noises.

The entire household is upset. The family members have time to do other things because they have to take care of the demands of the Beast. It wants the attention of the whole family. Talking and laughter returns from time to time, but not for long. No one can guess when the Beast will be happy or when it will be angry.

As the Beast gets worse, its true beastly face appears more frequently. Every family member suffers from the Beast's pain. Soon the faces of everyone in the family begin to resemble the face of the Beast. The people's clothing and belongings are ripped apart by the Beast as they flee. Destruction is everywhere! The whole community is suffering from the presence of the Beast.

The Medicine Person of the community knows the Beast and helps the families when they want to get rid of it. But the clever Beast always hides itself in different ways. The Medicine Person decides to meet with the elders to discuss the problem. All agree that few weapons will help fight the Beast. The Medicine Person reminds them that teachings from traditional values and "old ways" of the community can be used to battle the Beast.

All agree that the Beast cannot be defeated by one person alone, and all their people agree to meet. The Medicine Person shows them the two faces of the Beast. They learn about the power of the "old ways." And by studying the words and ways of their ancestors, they soon gain the wisdom and strength needed to resist the Beast. With fasting and prayers, singing and chanting and drinking only pure water from a spring above the tree line, the people prepare to battle the Beast. Together they are ready to restore their community to harmony and balance. They know that the Beast can reappear again if the people are weak. So, with the wisdom and insight they gained from the studying the "old ways," they are ready to fight the Beast.

CRITICAL CONCEPTS:

Prior to beginning this unit, students must have mastery of or familiarity with the following concepts and skills:

1. *stomach: function and location*
2. *small intestine: function and location*
3. *liver: function and location*
4. *villi: function and location*
5. *working in a cooperative group*
6. *journal writing*

TEACHER PREPARATION:

Display the Digestive System poster where it can be referred to throughout the unit. Gather materials needed for each activity and duplicate response forms.

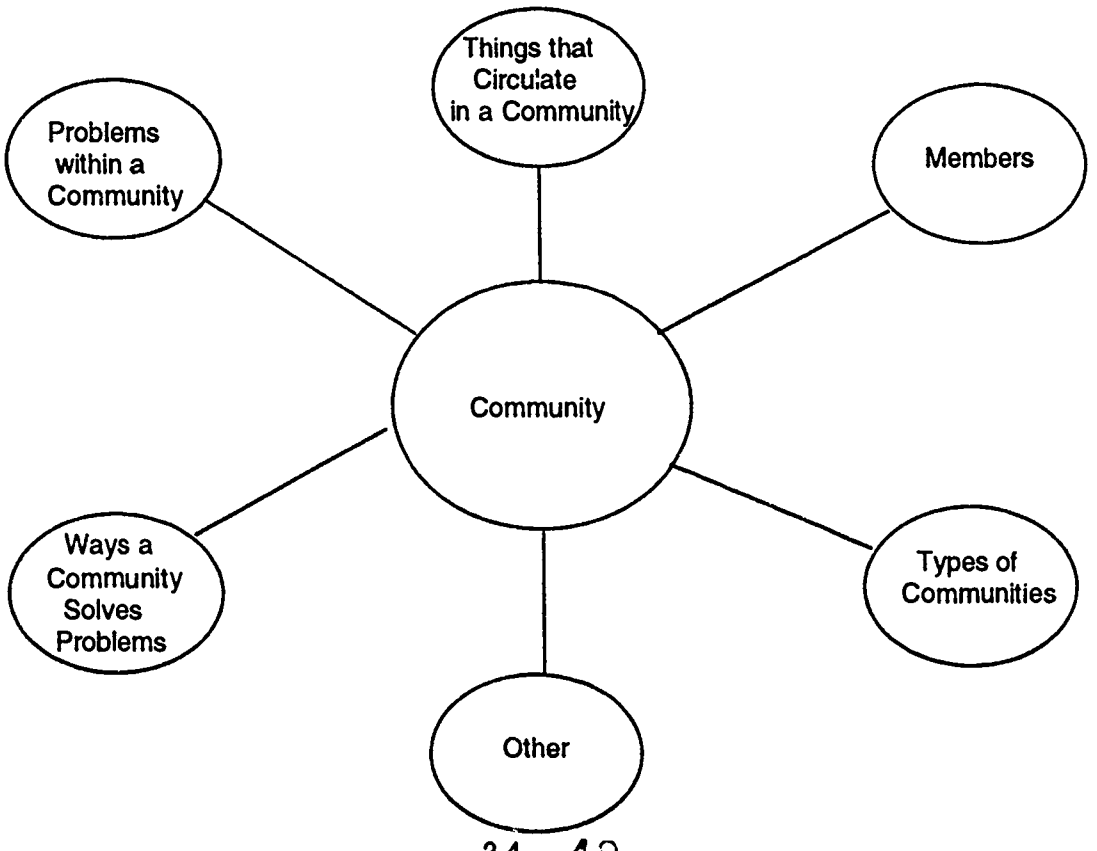
When involving community members in this curriculum, and you are unfamiliar with the local community, it is important to consult with a long term community member to help you identify possible participants. This community member may be able to ask the guests on your behalf. Community members could be any of the following: community health representatives, school faculty, school support staff, or a tribal government official.

For the Fact Finding Session, contact and invite a health professional from the community to speak with the students on the long-term effects of alcohol on the digestive system. The speaker may cover cirrhosis and malnutrition, as well as alcohol's effects on the health of the community as a whole. Possible contacts include the school nurse, Indian Health Service personnel and a community doctor or nurse. Encourage the speaker to bring any pamphlets, posters or visual aids in reference to alcohol use. Inform the speaker in advance that the students will share what they have learned about the immediate, short-term effects of alcohol on the digestive system.

For the Body Organ Activity, choose a student of average height to model for a life-size tracing of the human body. Either before or after class have the student lie on a piece of butcher paper. Using a marker trace around the student's body. This tracing will be used as the stencil for other identical tracings. Two "body outlines" will be needed for each group of four. These outlines should be prepared by the teacher prior to the activity.

A. COMMUNITY AND SCIENCE KNOWLEDGE

1. Begin the unit by placing the following visual on the board or chart paper. Students brainstorm ideas related to each topic of community. Record these responses on the visual.



2. Inform students that some community members will be involved in helping them study this unit. Using ideas generated from the visual, help students generate questions which they want to ask community members about their community.

3. Break students into groups of four to generate specific questions.

4. Help students clarify questions. Questions are copied and given to students.

5. Provide students the opportunity to ask community members their questions. (This may include bringing community members into the classroom, having students go out in the community, discussing these questions with family members or significant others.) Students document their responses.

6. Ask students to share their findings. This includes:
   - What questions did they ask the community members?
   - Who did they talk to and why?
   - What did they learn about their community?
   - How is this information useful?

B. THE STORY

1. Identify a community member to share the story, "The Medicine Person and the Beast". The story should be adapted to fit the students' culture and community.

2. Present the story with the following questions for the students to consider as the story is being presented:
   - How does a Medicine Person help people to help themselves within their community?
   - Why do you think some people did not come to the community meeting?

3. After presentation of the story, students retell or respond to the story in creative ways including murals, role playing, creative writing, etc.

C. DETERMINING BACKGROUND KNOWLEDGE

Prior to beginning the activities, ask the following questions:

1. What do you know about muscular action in the stomach?
2. What do you know about the villi in the small intestine?
3. What do you know about the functions of the liver?
4. What do you know about how the organs work together to provide the body with energy?

Record the students' responses on a chart. Provide time for students to add or change information to the chart throughout the unit.

D. ACTIVITIES

Divide the students into pairs and work with them as they complete the three activities. Pairs work together to complete one response form per activity.

Materials for each activity provide for one pair of students.

Activity 1:
How Does Alcohol Affect Muscular Action?
2 clear plastic bags
24 sugar cubes
water

Activity 2:
How Does Alcohol Affect the Villi in the Small Intestine?
1/4 c. macaroni
1" square of cotton cloth
1" square of terry cloth
1 medicine dropper
2 bags and their contents from Activity 1

Activity 3:
How Does Alcohol Affect the Liver?
2 clear plastic cups
2 medicine droppers
30 ml oil
1 dropper of alcohol
1 dropper of liquid dish soap
2 spoons or stirring rods
water

E. FACT-FINDING SESSION

Prior to the health professional's visit, students should form groups of four and write questions they have about the effects of alcohol on the digestive system. These questions can be centered around immediate alcohol effects, long-term alcohol effects, and effects of alcohol on a community. The questions can be used to lead the discussion with the health professional. Pamphlets are included to help clarify and reinforce the topics of cirrhosis and malnutrition.

F. BODY ORGAN ACTIVITY

Reassemble students into the same groups they were in during the Fact Finding Session. Provide each group with two "Body Outlines." Students label one "healthy" (alcohol-free) and the other "unhealthy" (alcohol present). Working together, students cut out the digestive organs and place them within the body outline. Illustrations and captions for each organ should be added showing the differences between the two body types. Additional information from the "fact-finding" session can be added by each group to personalize their "body". The "body outlines" should be shared with the class.

Materials provide for one pair of students.
scissors
art supplies
glue
body organ cut-outs
whole body outlines

G. SHARING SESSION

Using the body outlines, students share the short- and long-term effects of alcohol on the digestive system and their community. Audiences may consist of other classmates, primary age students, and/or community members. Body outlines might also be displayed in the school or community.

H. UNIT REVIEW ACTIVITIES: Select one or more of the following to reinforce concepts explored in the unit.

1. Divide students into pairs. Each pair designs a visual that summarizes information about how alcohol deprives a body and community of energy. These can be shared with the class.

2. Students write letters to a person of their choice explaining the effect of alcohol on the body and community. They include references to the stomach, small intestine, and liver.

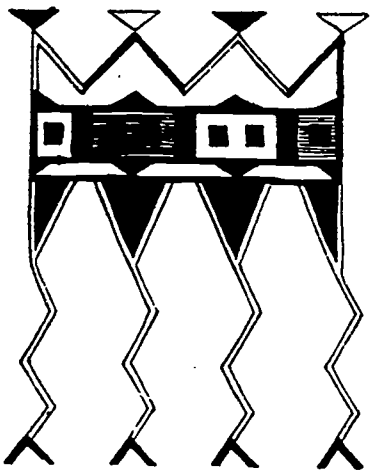
3. Ask students to work in small groups to answer the question, "What have we learned about how alcohol deprives a body and community of energy?" Add responses to the chart from the beginning of this unit.

I. **POST ASSESSMENT:** Each individual student completes the following task:

In your own creative way show what you have learned about how alcohol deprives a body and community of energy?

See "Ways to Share Information" page for ideas.

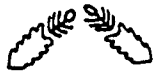
SAFETY TIPS:	*Rubbing alcohol is poisonous and should not be swallowed. All of the substances should be handled with care.*
CLEAN UP:	*Encourage students to make the best possible use of the Creator's gifts by recycling whenever possible. The plastic containers can be cleaned and used again.*
VOCABULARY:	
Alcohol:	*A drug found in beer, wine, and hard liquor that slows down the way the body works and irritates the cells it touches. When people become dependent on this drug, they have the disease of alcoholism.*
Bile:	*A fluid produced in the liver that aids in the digestion of fats.*
Digestion:	*The process of breaking down large food particles into small ones that can be used by the body.*
Fats:	*Nutrients that provide the body with the most concentrated form of energy.*
Liver:	*The digestive organ that produces bile, prepares nutrients for use by the body cells, removes poisons from the blood, and performs many other functions.*
Muscular Action:	*Alternate waves of contraction and relaxation in the walls of the digestive system. This action churns the food and moves it along to the next organ.*
Nutrient:	*Substance that an organism needs for energy and growth.*
Organ:	*A body part that performs a certain function.*



Ways to Share Information

block picture story

play



word search

mobile

flannel board story

photograph

sculpture

skit

rebus story

illustrated story

triangle poem

radio program

advertisement

interview

book jacket

graph

puppet show

transparency

letter to the editor

scrapbook

filmstrip

triplet

riddle

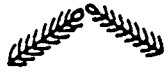
picture dictionary

game

collection

newspaper article

poem



booklet

survey

journal

labeled diagram

vocabulary list

prayer

chart

map

jigsaw puzzle

greeting card

poster

fact file

demonstration

collage

tapes

diorama

Activity 1: How Does Alcohol Affect Muscular Action?

Names _____

1. In the chart below, either write or draw your predictions based on these questions:
   -What will happen to a plastic bag filled with sugar cubes and water that is left still?
   -What will happen to a plastic bag filled with sugar cubes and water that is shaken?

   Prediction:

Without movement	With movement
(Answers will vary.)	

2. Gather the following materials:
   2 clear plastic bags
   24 sugar cubes water
3. Label one of the bags "A" and the other one "B".
4. Fill each bag approximately 1/3 full of cold water.
5. Place 12 sugar cubes in each bag and carefully close the bags.
6. With as little movement as possible, place Bag A on a desk or table.
7. Gently shake Bag B for 60 seconds.
8. After 60 seconds immediately record your observations in the boxes below. Results drawn.

Observations:

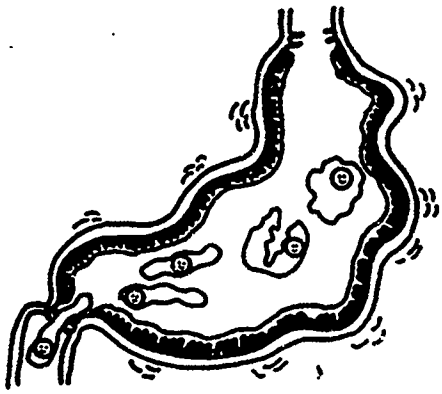
Bag A	Bag B

9. How did your results compare with your predictions?

10. In this activity what represents the stomach? What represents food in the stomach?

11. Explain the differences between Bag A and Bag B.

12. What is the purpose of movement or muscular action in the stomach?



13. Bag A represents the muscular action of a stomach with alcohol. Describe the effect of alcohol on the stomach and the food that person has just eaten.

14. Why would it be a problem to have food in large pieces entering the small intestine?

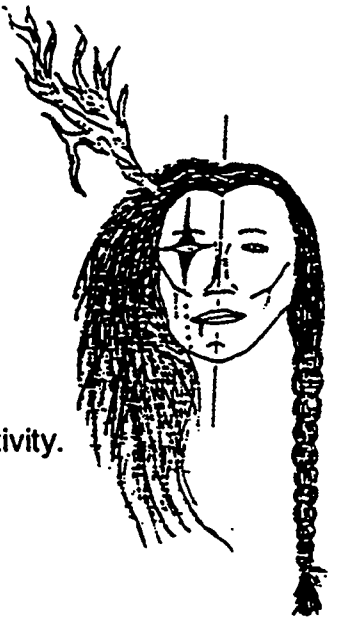
15. Explain how alcohol deprives a person of energy.

16. Describe how your body would feel if it did not get enough nutrients. How would this affect your community?

_____

_____

17. In the story, the Beast uses an untrue face to get into people's lives. Identify the many faces of alcohol.

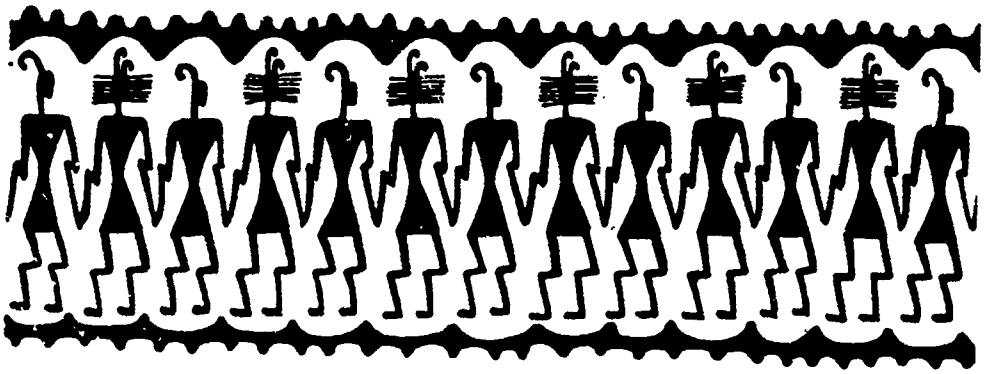


_____

_____

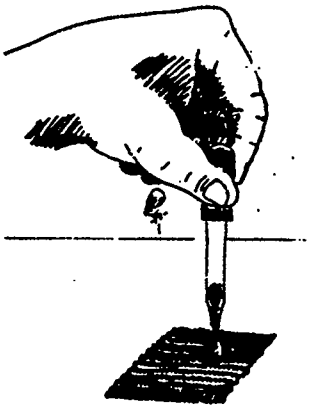
_____

Note: Save the bags and the contents for use in the next activity.



Activity 2: How Does Alcohol Affect Villi in the Small Intestine?

Names _____ _____



Procedure:

1. Gather the following materials:
   Bags A and B with contents from Activity 1
   1" square of smooth cotton cloth
   1" square of terry cloth
   1 medicine dropper
   about 1/4 cup of macaroni

2. Villi are the finger-like projections that line the small intestine. In this activity the terry cloth represents healthy villi and the smooth cloth represents villi flattened by alcohol. Look at the two pieces of cloth and predict which one has the ability to absorb more nutrients (as represented by drops of water).

_____

_____

3. Discuss the reasons you predicted the number of drops would or would not be the same for different kinds of villi (as represented by the cloth).

_____

_____

4. Use the medicine dropper to slowly add water from Bag A (the plastic bag containing alcohol) onto the piece of smooth cotton. Count the number of drops the cotton absorbs and stop when the water starts to leak out of the fabric. Record this number in the chart below.

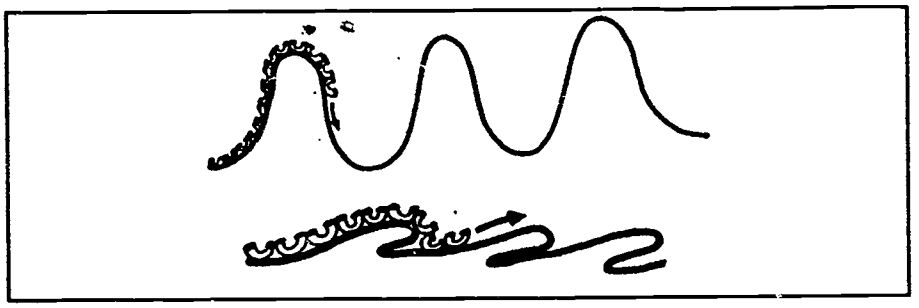
	Healthy Villi (Terry Cloth)	Villi Flattened by Alcohol (Smooth Cloth)
Amount of Nutrients (water drops) Absorbed		

5. Repeat this procedure adding water from Bag B (the plastic bag containing no alcohol) to the piece of terry cloth.

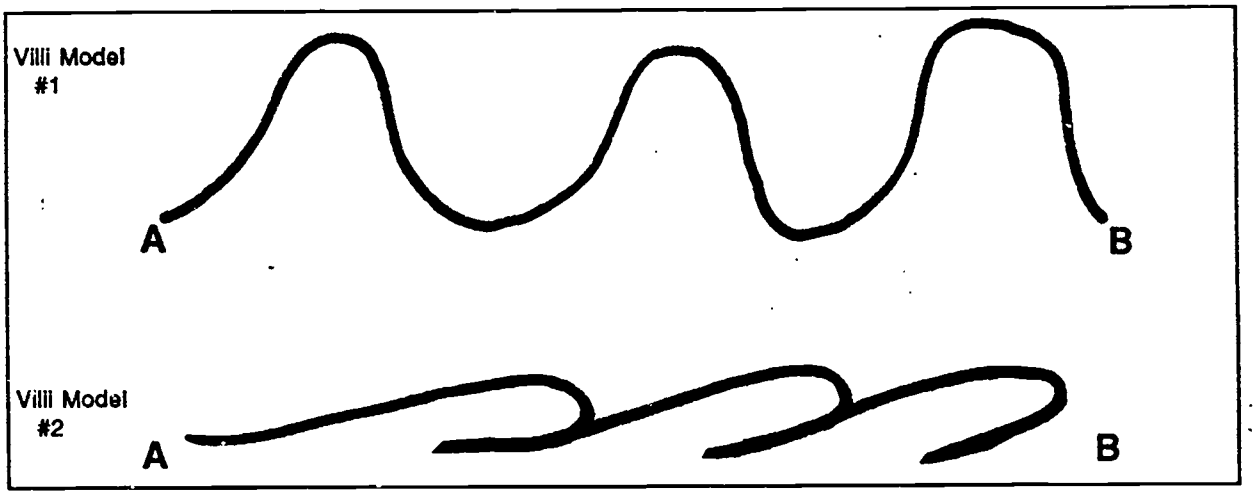
6. Explain how the villi's ability to absorb nutrients is affected by the presence of alcohol (as represented by the smooth cloth example).

_____

_____



7. Line up the macaroni end-to-end, from Point A to Point B on both of the lines in the box below. These represent close-up models of the villi in the small intestine.



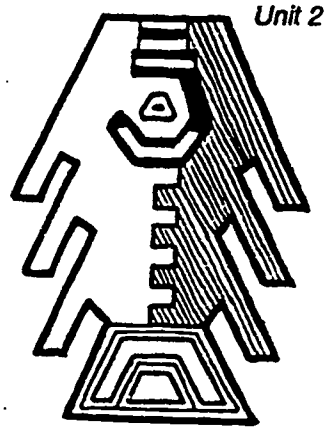
8. Count and record the number of macaroni used along each line.

macaroni on Villi Model #1	macaroni on Villi Model #2
_____	_____

9. Which villi model has more area to absorb nutrients? Why are finger-like projections more useful in the small intestine than a flat surface?

_____

_____



10. How could flattened villi deprive the body of energy?

11. In what way does alcohol deprive your community of energy?

12. The Medicine Person helped to guide people away from the Beast. What can you and your community do to guide people away from alcohol?

Note: You may now dispose of the contents of the bags.

Activity 3: How Does Alcohol Affect the Liver?

Names _____ _____

Procedure:

1. Gather the following materials:
   - 2 clear plastic cups
   - water
   - 30 ml of oil
   - 2 spoons or stirring rods
   - 1 dropper of liquid dish soap
   - 1 dropper of alcohol
2. Label one of the cups "A" and the other one "B".
3. Fill each cup approximately 1/3 full of cold water.
4. Pour 15 ml of oil into each cup.
5. Add one dropper of alcohol to Cup A.
6. Add one dropper of liquid dish soap to Cup B.
7. Record your observations in the table in item 10.
8. Write or draw a prediction to show what you think will happen to the liquids in Cup A and Cup B after they're stirred for 60 seconds.

_____

_____

_____

9. Using separate spoons or stirring rods, one of you stirs Cup A while the other stirs Cup B for 60 seconds.
10. After 60 seconds, carefully observe and compare both cups. Record your results in the table below.

Observations	Cup A (with alcohol)	Cup B (without alcohol)
Appearance before stirring		
Appearance after stirring		

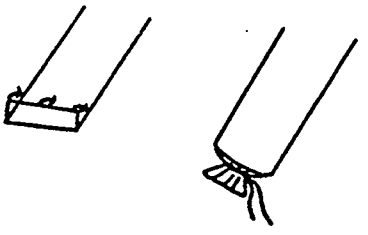
Activity 3: How Does Alcohol Get Into Cells?

Names _____

1. Gather the following materials:
   - 500 ml of colored water
   - 1 dropper
   - 2 - 6" strips of dialysis tubing (soaking in water)
   - 2 clear plastic cups
   - 4 - 6" pieces of thread
   - 2 strips of masking tape

2. Remove one strip of dialysis tubing from the cup of water.

3. Fold over the end of the tube about 1/2 inch. Tie it tightly with thread.



4. Use a dropper to add clear water to the tube.

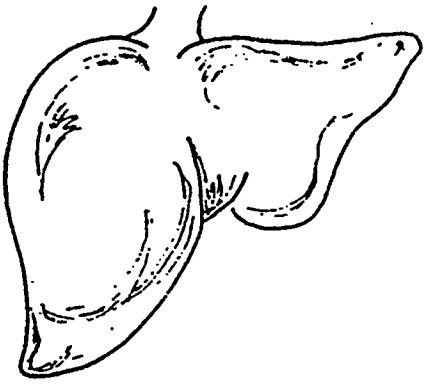
5. Gently fold over the open end about 1/2 inch and tie it off with the thread.

11. How did your prediction compare with your results?

12. What substance was added to Cup B that was not added to Cup A and what effect did this have on the oil?

13. Would it be easier to digest the oil in Cup A or Cup B and why?

14. Bile helps to break up fats in the small intestine. In this activity what substance represents bile?



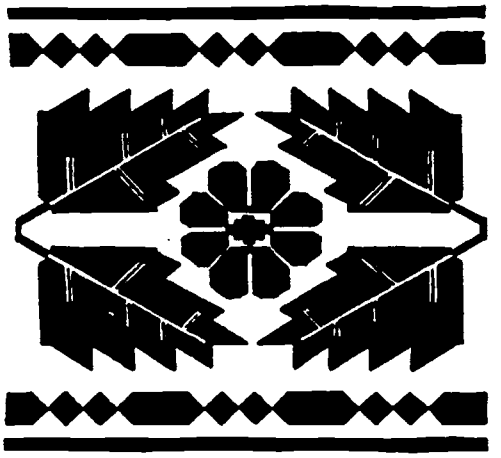
15. One of the many important jobs of the liver is to break down poisons. The liver responds to alcohol as an emergency. It must break down this poison before it can do any of its other jobs. When the liver doesn't do its jobs, the whole body is affected. Complete the following chart.

Some Other Jobs of the Liver	How the Body Works with No Alcohol Present	How the Body Works with Alcohol Present
1. Produce Bile		
2. Prepares Nutrients		

16. How would a body feel if the jobs of the liver were interrupted by alcohol?

17. Why would alcohol be considered an emergency in your community?

18. The problem of alcohol, like the Beast, cannot be defeated by one person alone. Discuss ways to involve more community members in the fight against alcohol.



How Does Alcohol Deprive the Body and Community of Energy?
Answer Form

Activity 1: How Does Alcohol Affect Muscular Action?

1. (Answers will vary.)

9. Bag A: (Sugar cubes partially break down.)
   Bag B: (Sugar cubes completely break down.)

10. (Answers will vary.)

11. (stomach = bag, food = sugar cubes and water)

12. (Bag A had alcohol and was not moved - the cubes broke down less. Bag B did not have alcohol and was moved and the cubes dissolved completely.)

13. (It helps break down food from larger to smaller pieces.)

14. (The stomach moves less; therefore, food is passed to the small intestine in larger pieces.)

15. (Food in large pieces would not be broken down into small enough size for nutrients and energy to be absorbed into the body.)

16. (Less nutrients are absorbed; therefore, the body lacks energy.)

17. (We would feel tired and weak. We would not be able to do our part in the community.)

18. (Faces could include sad, angry, mean, joking, etc.)

Activity 2: How Does Alcohol Affect Villi in the Small Intestine?

2. (Answers will vary.)

3. (Answers will vary.)

4. Terry Cloth: (approximately 35-40)
   Smooth Cloth: (approximately 7)

6. (Their shape is flattened and they absorb much less nutrients.)

8. Flattened Villi: (approximately 9)
   Healthy Villi: (approximately 15)

9. (Villi Model #2 - Villi allows for greater absorption.)

10. (Less nutrients are absorbed; therefore, the body tires easily.)

11. (When people drink, they don't spend time working or being with their family.)

12. (Choosing not to drink, encouraging friends to be sober, education, counseling, and participating in drug-free activities.)

Activity 3: How Does Alcohol Affect the Liver?

8. (Answers will vary.)

10. Cup A with alcohol before stirring: (oil slick on top of water)
    Cup A with alcohol after stirring: (oil slick on top of water)
    Cup B without alcohol before stirring: (oil slick on top of water)
    Cup B without alcohol after stirring: (oil broken into droplets)

11. (Answers will vary.)

12. (soap) (The soap helps to break up the oil.)

13. (Cup B) (The oil in Cup B is in smaller droplets, which are easier to digest.)

14. (bile = soap)

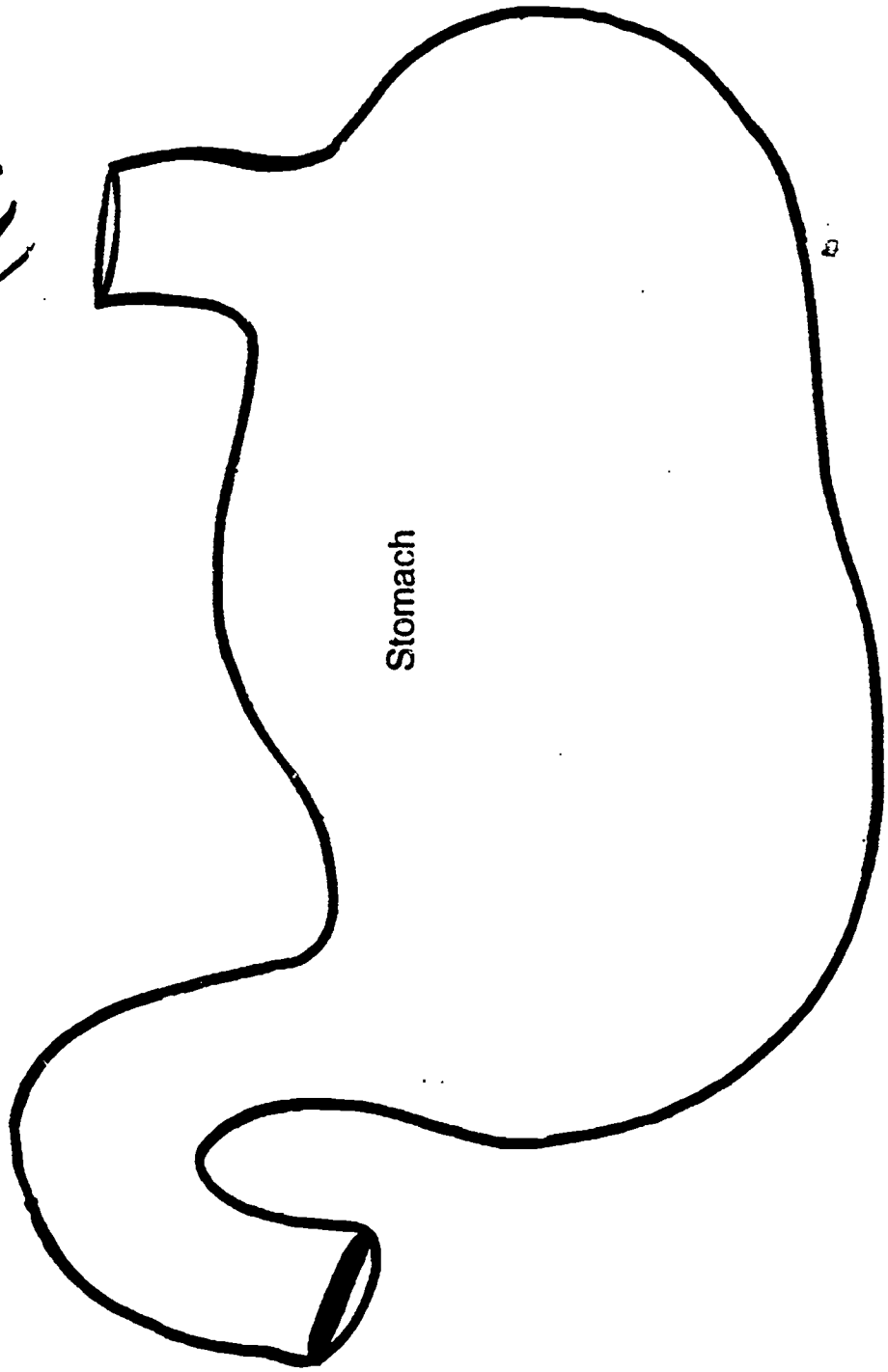
15. No alcohol present - produce bile (fat is broken down)
    No alcohol present - prepares nutrients (body uses nutrients)
    Alcohol present - produce bile (fat is not broken down)
    Alcohol present - prepares nutrients (body loses nutrients)

16. (The body would tire easily and not work as effectively.)

17. Alcohol increases the number of accidents and deaths. These require immediate responses from community members.)

18. (Conduct community meetings, radio and newspaper advertisements, mentoring, talking to younger kids, etc.)

Body Organ Outlines


Stomach

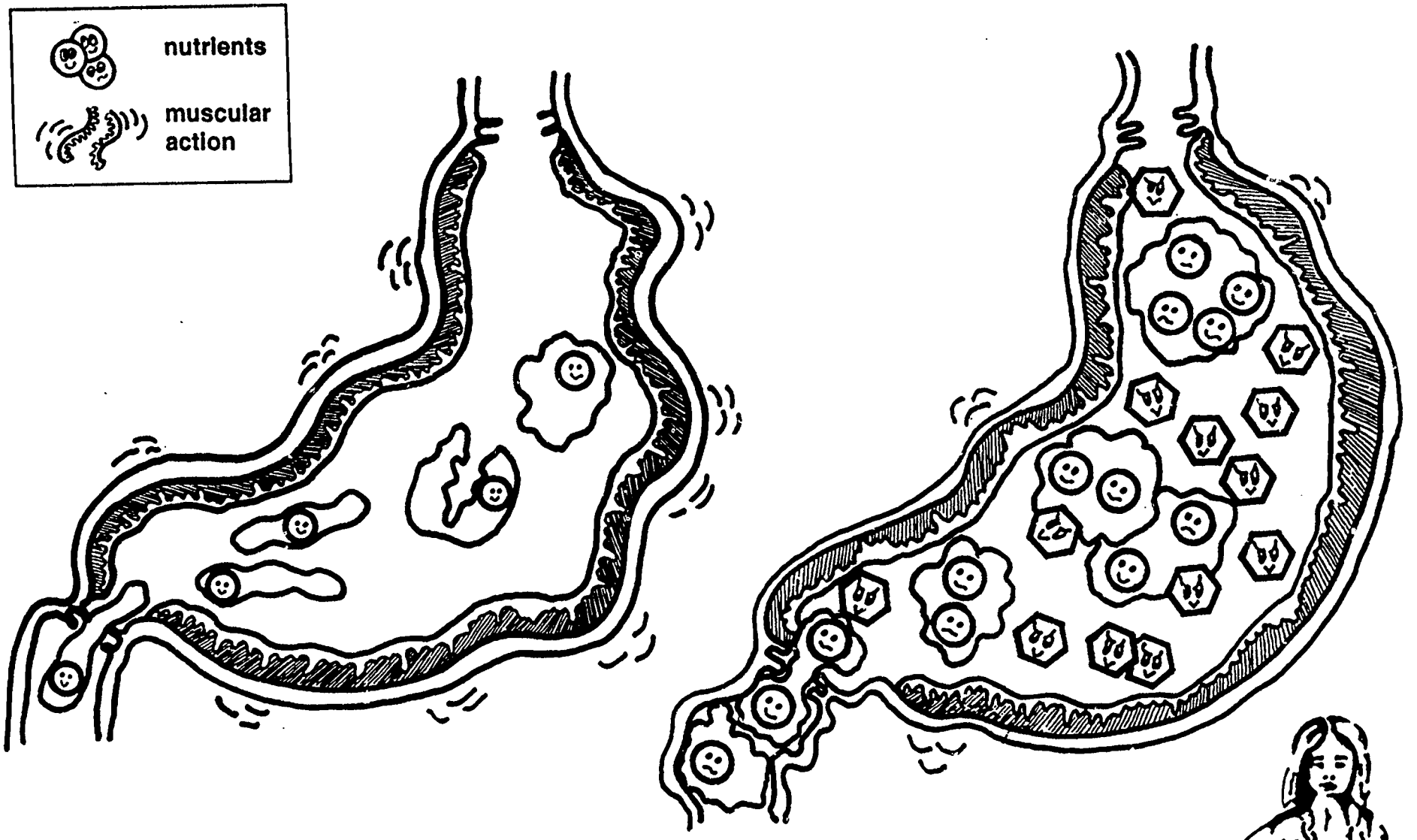
Small Intestine

Large Intestine

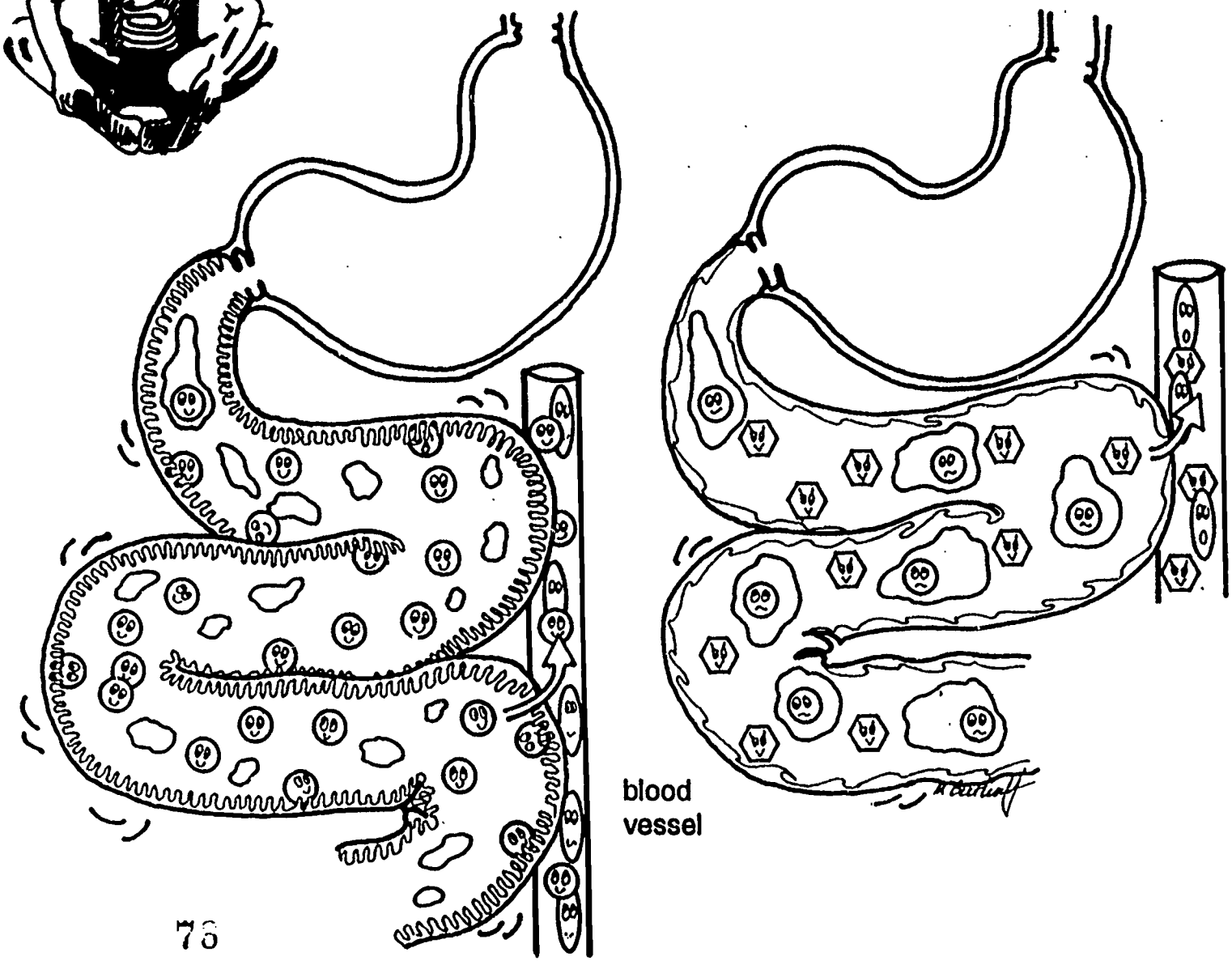
Liver

Transparencies and Handouts

Alcohol and the Stomach

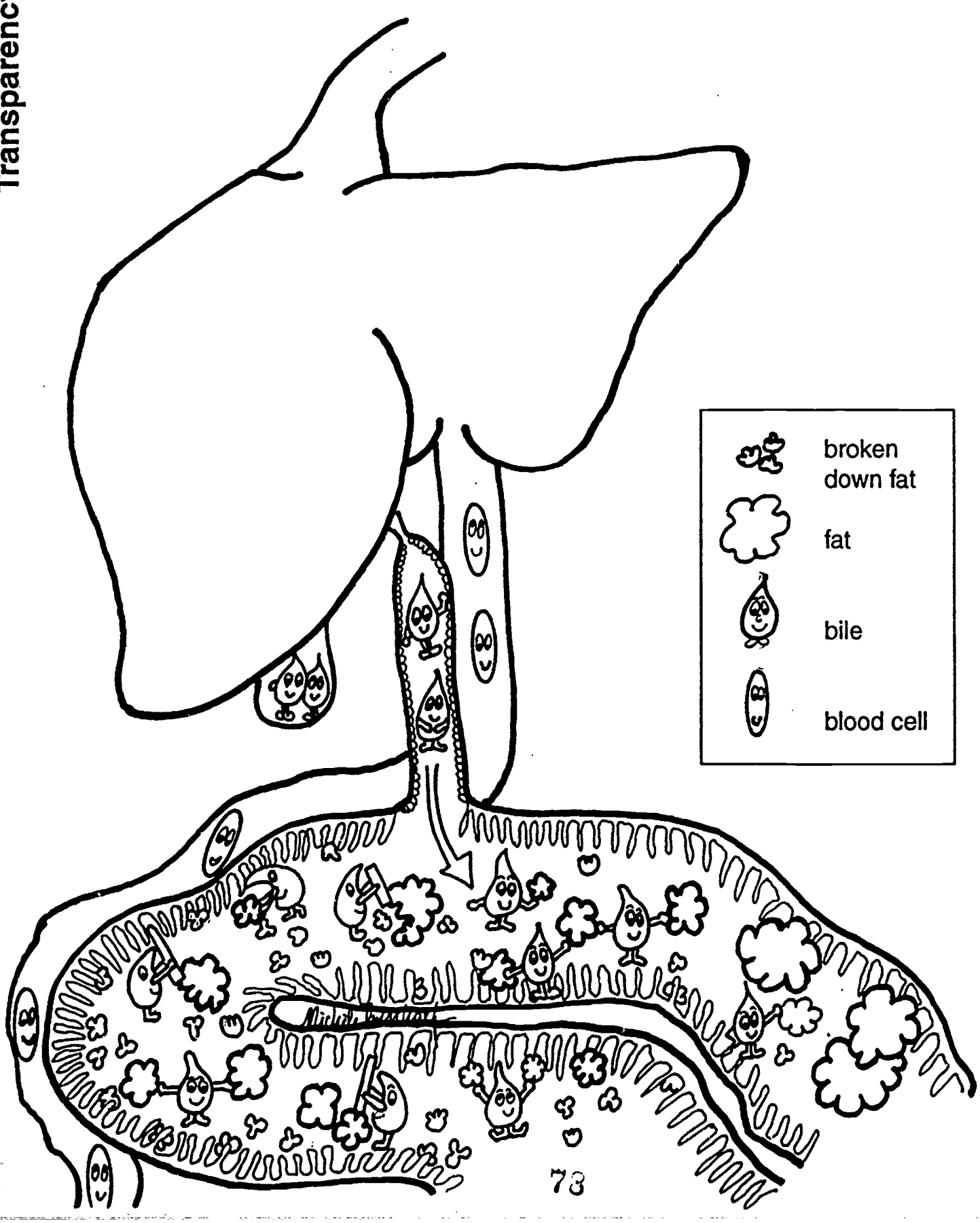


Alcohol and the Small Intestine



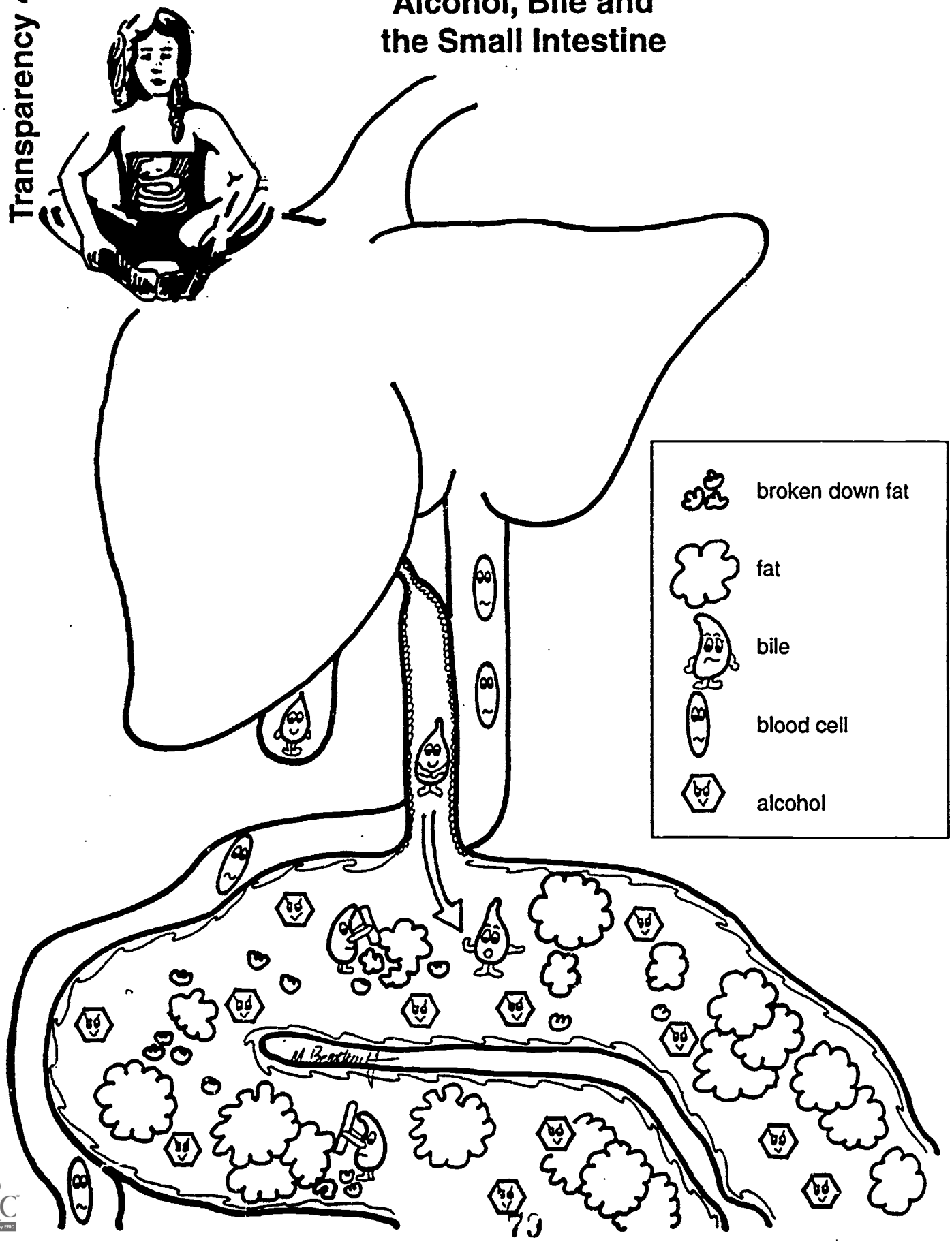
Transparency 3

Bile and the Small Intestine



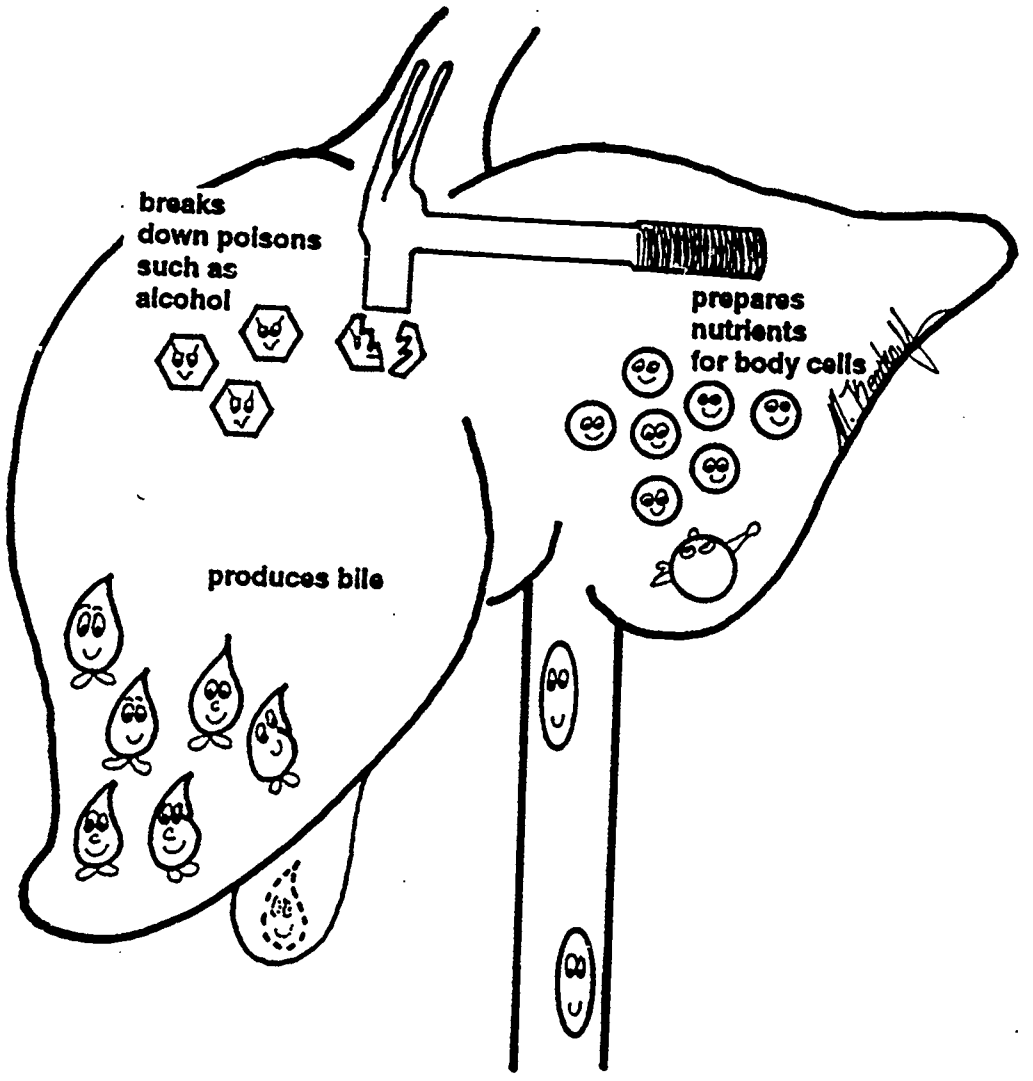
Transparency 4

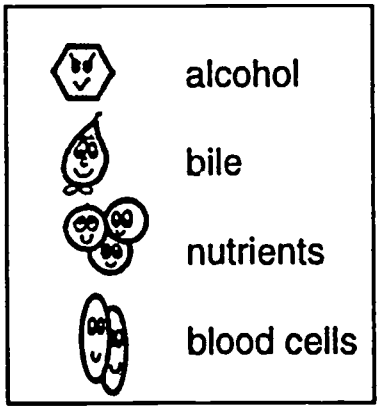
Alcohol, Bile and the Small Intestine



Transparency 5

Three of the Liver's Jobs



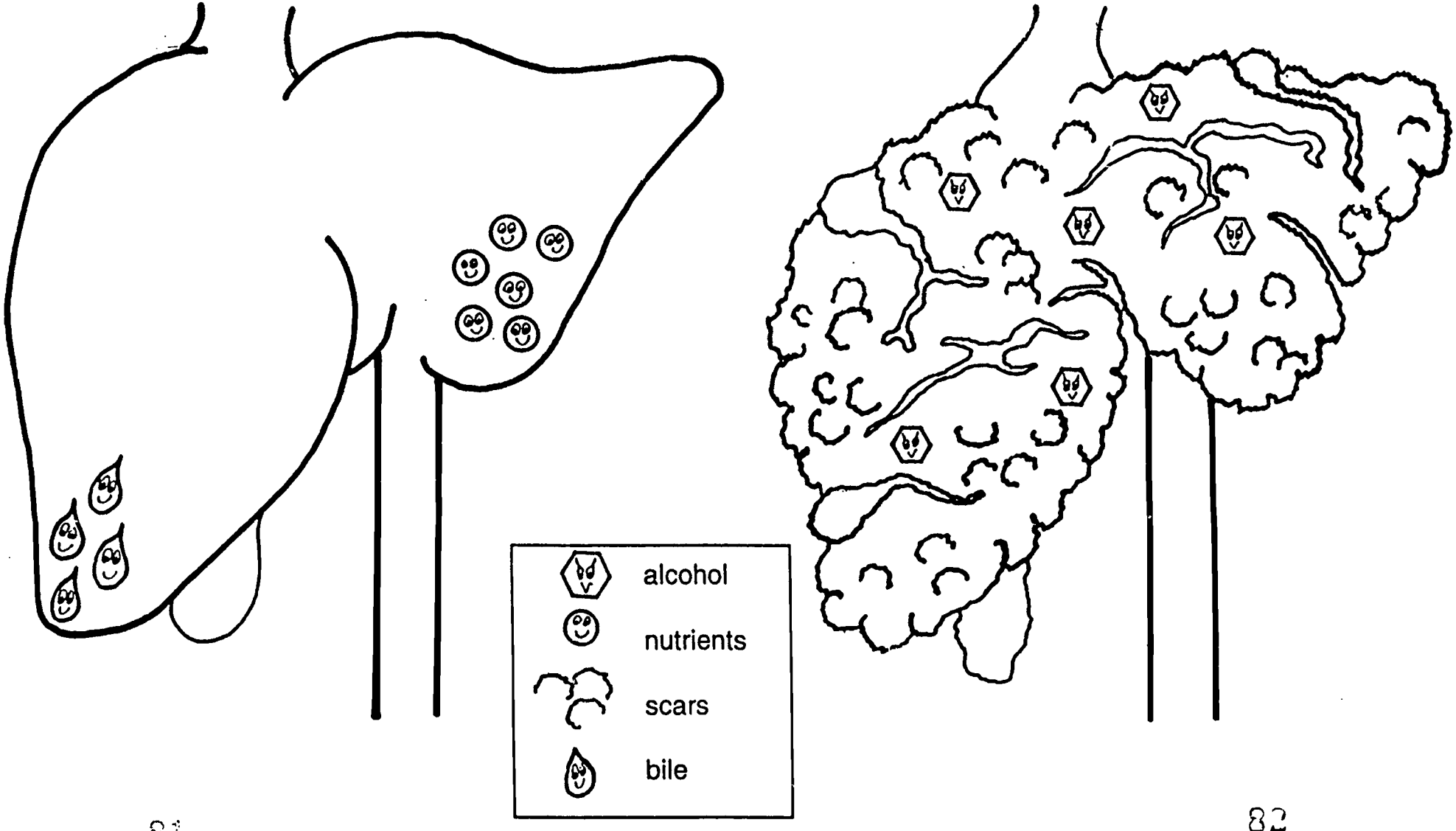


Transparency 6

Cirrhosis of the Liver

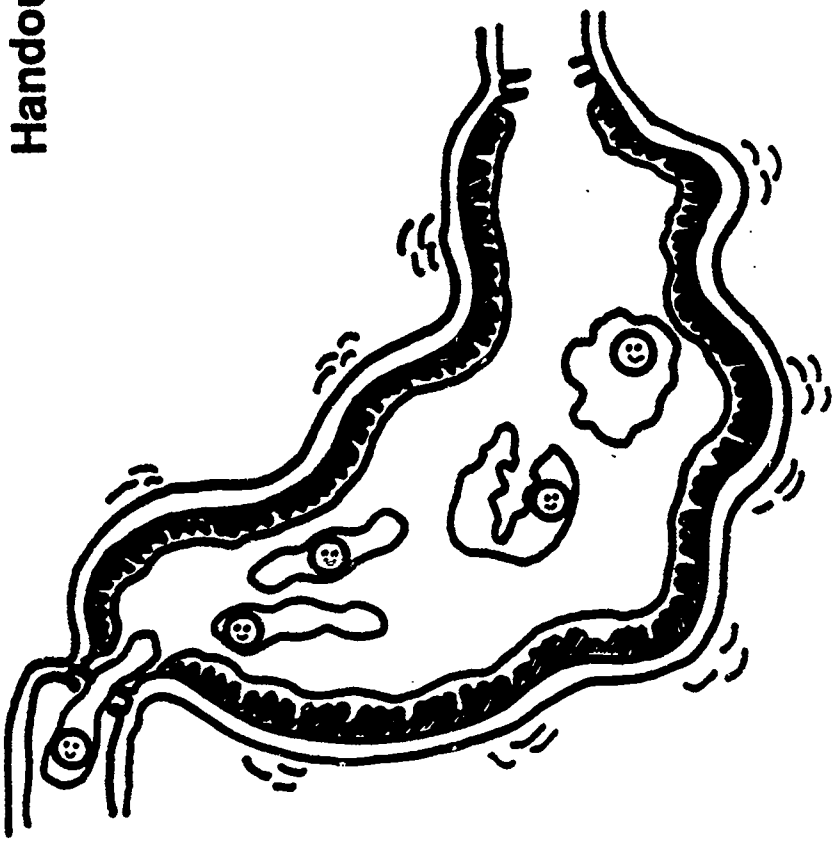
Healthy Liver

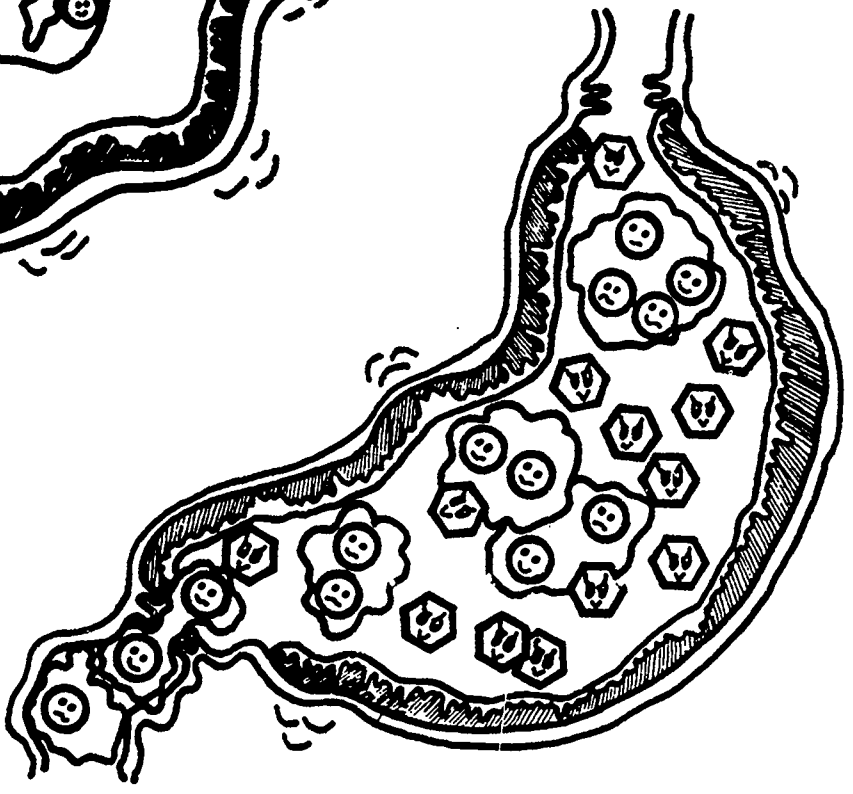
Liver with Cirrhosis



Handout 1

Alcohol and the Stomach



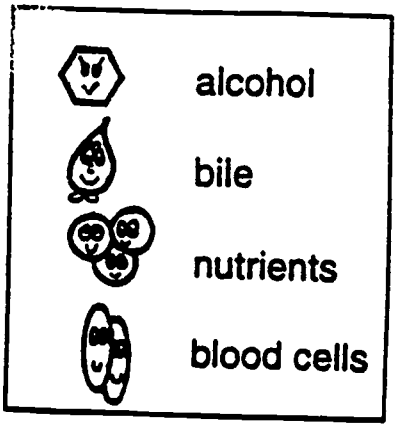


Color:
food and nutrients red
alcohol green
stomach wall blue

Answer the following questions on the back of this paper:

1. What does alcohol do to the stomach's muscular action?

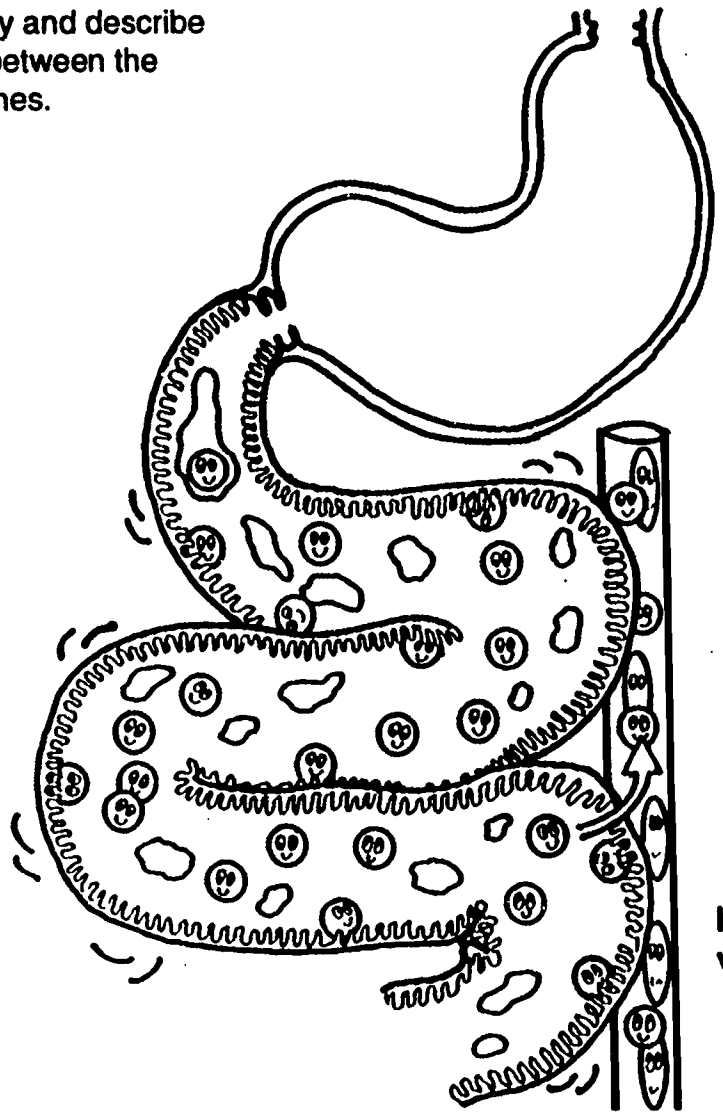
2. What happens when muscular action is slowed down?

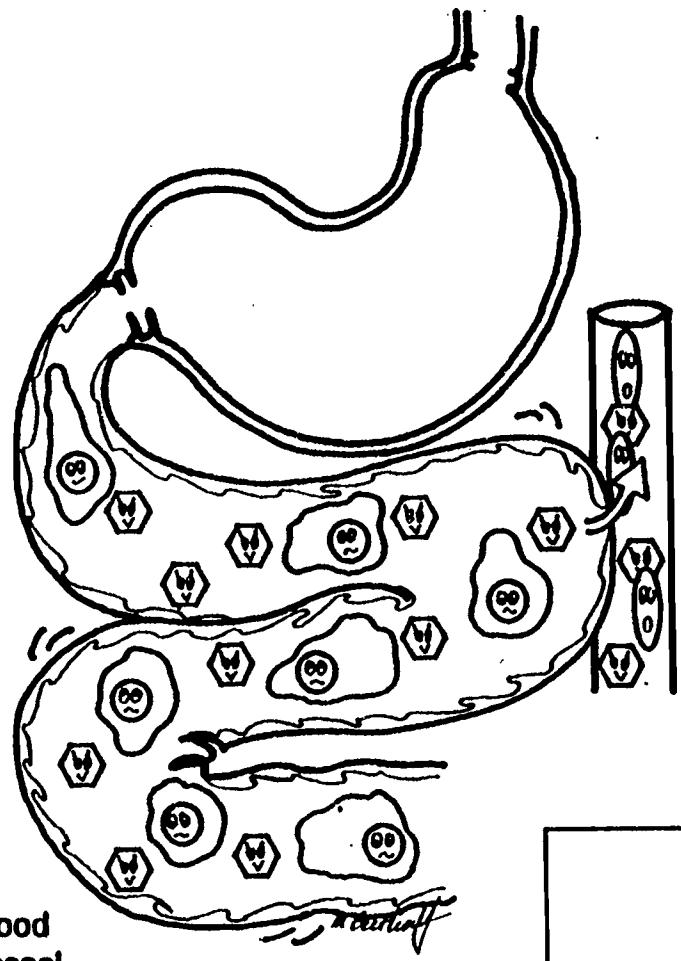


Alcohol and the Small Intestine

Handout 2

Complete the key and describe the differences between the two small intestines.





blood vessel

alcohol
waste
nutrients
blood cells
villi
muscular action

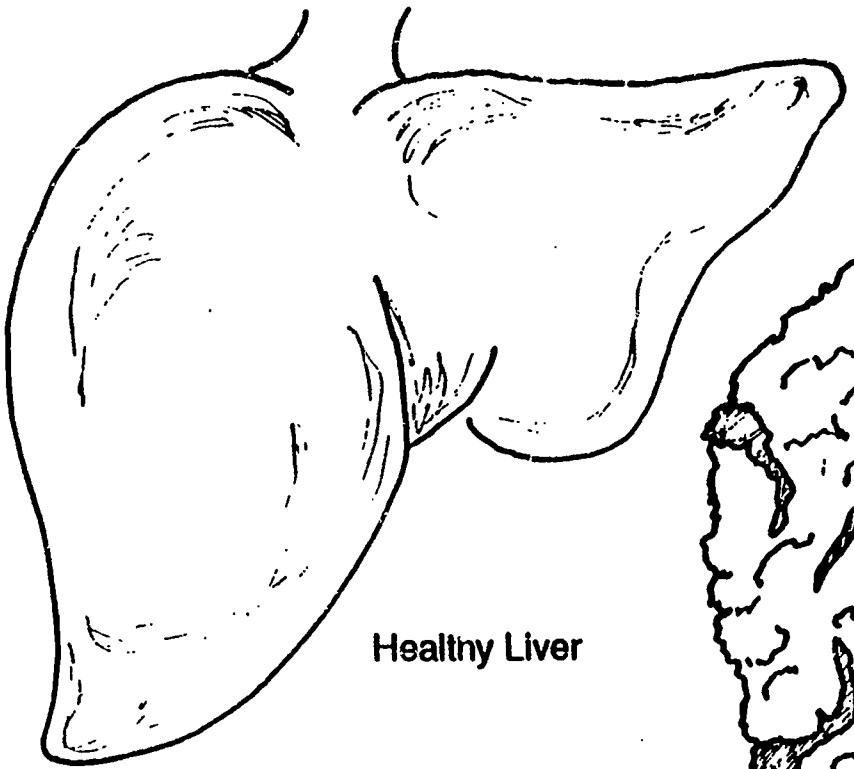
_____ _____

_____ _____

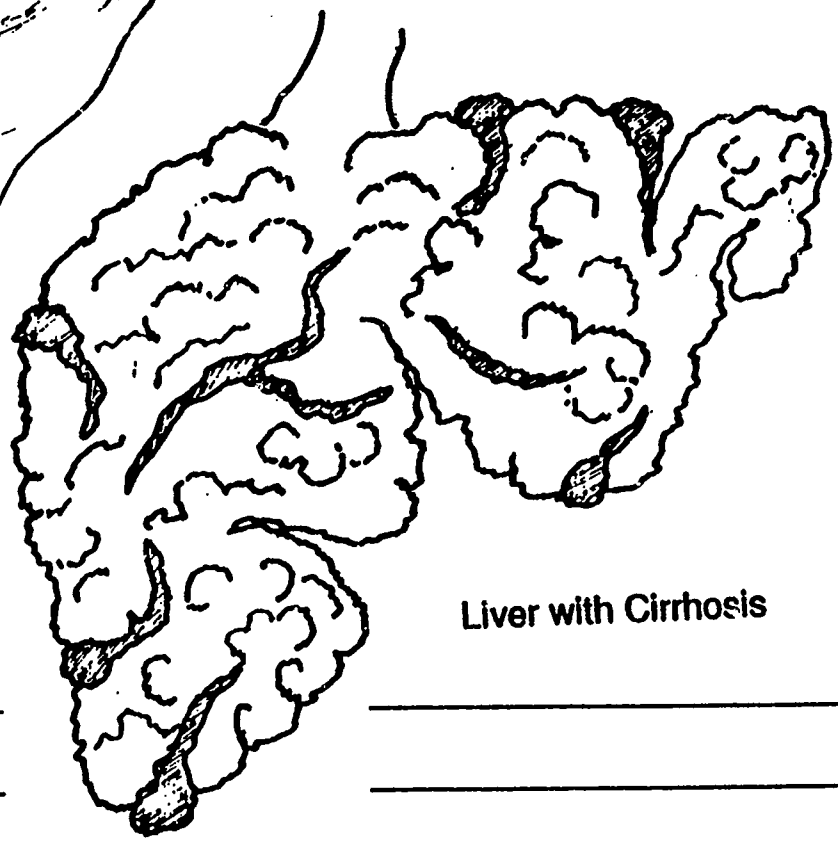
_____ _____

Alcohol and the Liver

Use the lines below to describe a healthy liver and a cirrhotic liver.



Healthy Liver

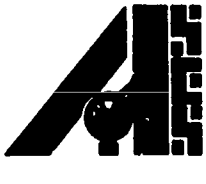


Liver with Cirrhosis

What Is Fetal Alcohol Syndrome and How Does It Affect the Community?

An Interdisciplinary Approach to the Study of the Science of Alcohol for Upper Elementary and Middle Level Students

SACAI Unit Three



American Indian Science and Engineering Society
1630 30th Street, Suite 301
Boulder, CO 80301

Post Assessment - Teacher
What Is Fetal Alcohol Syndrome and How Does It Affect the Community?

Teacher: _____

School/State: _____ _____

Grade Level(s): _____

Percent American Indian in School/Tribe(s): _____ _____

Number of Classes/Students: _____ _____

1. In what ways did the community members help the students in understanding the problem of alcohol in the community?

_____

_____

2. In what specific ways did the curriculum challenge the students to use their critical thinking and problem solving skills?

_____

_____

3. How did the students demonstrate creativity in completing the Post Unit Assessment Activity?

_____

_____

4. What instructional adaptations did you have to make to successfully teach this unit?

_____

_____

Write Additional Comments on Back.

Return the completed form to the SACAI project:

AISES
1630 30th St., Suite 301
Boulder, CO 80301

Post Assessment - Student

What Is Fetal Alcohol Syndrome and How Does It Affect the Community?

Grade: _____

Circle the number that tells how you feel about each item.

1 = strongly disagree
2 = disagree
3 = agree
4 = strongly agree

1. The community members helped me to understand the problems with alcohol.

   1 2 3 4

2. I have a better understanding of how alcohol affects my body.

   1 2 3 4

3. I liked the activities in SACAI.

   1 2 3 4

4. I think other students my age should study SACAI.

   1 2 3 4

5. What I like best about SACAI is: _____

   _____

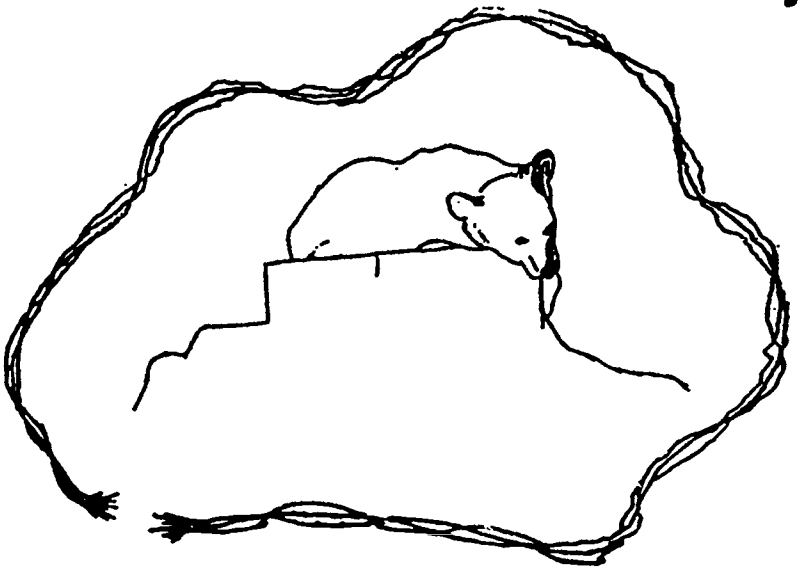
6. What I like least about SACAI is: _____

   _____

Return the completed form to the SACAI project:

AISES
1630 30th St., Suite 301
Boulder, CO 80301

What is Fetal Alcohol Syndrome and How Does It Affect the Community?



Holistic Statement: Fetal Alcohol Syndrome (FAS) is a group of alcohol related mental and physical birth defects. During pregnancy, an FAS fetus is inhibited in growth, develops abnormal facial features, and is often mentally retarded. In many American Indian communities, the birth of a child is considered sacred and celebrated. Causing harm to the unborn is breaking the sacred responsibility for that new life.

Unit Goal: The purpose of this unit is to study the effects of FAS on an individual and a community. (Class time for the completion of the unit is 7 - 10 class periods.)

Unit Outcomes: The students will:

- describe at least 3 ways FAS can affect an individual
- illustrate how FAS affects a community
- describe how FAS can be prevented

Unit Assessment: The post unit assessment and the unit activities are designed to provide ongoing assessment as students complete the tasks and associated response forms.

Interdisciplinary Connections: This curriculum emphasizes the application of interdisciplinary skills and knowledge in the study of the science of alcohol. This includes use of the following in integrative ways: critical thinking, problem solving, reading, writing, mathematics, and community learning.

Journal: The journal is to be used as a problem-solving tool for students and teachers as they reflect on what they learn and set down their feelings in words. Writing in the journal serves as a way to clarify thoughts, feelings, and learning and should be shared with others at the discretion of the writer. Sharing of journal entries by both students and teachers enhances the concept of community. Journal entries may be made at any time throughout the unit. However, some of the suggested times are indicated in the unit by the symbol ✍.

SACAI Sharing Box: SACAI and related topics are sensitive issues; students may have trouble speaking out in class about their concerns. Using a sharing box allows the students to voice their concerns or questions in an anonymous non-threatening way. Students may ask any questions or make any statement they wish about alcohol and their lives through the sharing box. Set aside class times to discuss and seek the assistance of community members for answers to questions you do not know.

Content Summary

Science Background Summary for the Teacher

Fertilization is the first step in the development of a new human being, and it all starts with the act of intercourse. When a male ejaculates, he releases millions of sperm into the female's vagina, but only a few thousand survive the journey through the vagina, uterus, and into the fallopian tube. There, if an egg has recently been released from the ovary, fertilization can take place. Once a sperm has been drawn into the egg, chemical changes prevent penetration by other sperm. This single cell has the potential to become a complete human being. Over the next three to four days, it will divide repeatedly while it moves down the fallopian tube to the uterus.

Once in the uterus, the ball of cells attaches to the uterine wall and "burrows in." At this stage, most women are unaware that they are pregnant. The ball of cells has been nourished by the nutrients that were present in the original egg cell. Now, however, a better life support system is needed. Early in pregnancy, the placenta, amniotic sac, and umbilical cord develop, establishing a vital link between the mother and the developing baby. By the end of the second week, a simple circulation between the uterus and the placenta is operating, and by the 5th week, the umbilical cord, which contains blood vessels that connect the embryo to the placenta, is fully developed.

After 8 weeks, the embryo is called a fetus. Nutrients are delivered to the fetus and wastes removed from the fetus via the placenta. Oxygen and nutrients diffuse from the mother's blood across the capillary walls and enter the fetus' blood cells. Similarly, waste products from the fetus diffuse into the mother's blood where they are removed by her lungs and kidneys. Although the fetal and maternal circulatory systems come into contact in the placenta, blood from the two systems does not intermix.

The umbilical cord, the connection between the mother and the fetus, consists of one umbilical vein and two umbilical arteries. The umbilical vein carries oxygen and nutrient-rich blood from the placenta to the fetus; the umbilical arteries carry waste-laden blood from the fetus to the placenta.

Alcohol Information Summary for the Teacher

When a pregnant woman drinks, the alcohol reduces the flow of blood through the placenta. This means that the fetus receives less oxygen and fewer nutrients - both of which are important for growth and development. In addition, the blood that does reach the fetus contains alcohol. Exactly what alcohol does to fetal cells is not known. However, it can disrupt or inhibit normal cell growth. Children exposed to alcohol while in the uterus are 10 times less likely to survive.

The first three months of a pregnancy are the most critical since tissues and organs are developing. Anything that disrupts development at this stage is likely to result in a structural or functional abnormality or, if severe enough, in fetal death. At this stage, alcohol could affect cell division, cell movement, or the ways cells organize themselves to form specific structures. Any structure that is developing at the time alcohol is present could possibly be affected by the exposure. Some common FAS-affected structures include deformed joints and malformed facial features. A small head and brain, a flat facial profile, a narrow upper lip and a missing vertical groove dividing the nose and upper lip are some hallmark features of FAS facial abnormalities. Heart defects and nearsightedness are also common.

During the next three months, the fetus' organs continue to develop - more nerve cells are incorporated into the brain, the tiny tubules in the kidney form, and in general, the internal structure of each organ is refined. Anything that interferes with this stage of development is likely to cause functional problems. Of course, if the fetus is exposed to something harmful, such as a particularly heavy and long "binge," death could result.

The last three months of a pregnancy are a time of rapid growth for the fetus. Overall body size increases and the baby puts on additional weight, developing fat stores for its existence outside of the

uterus. At this time, proper nutrients are needed for healthy growth. If the mother gets her calories from alcohol instead of nutritious foods, the baby will not be able to grow adequately.

The brain, an extremely complex and important structure, forms during the entire pregnancy. The developing brain is particularly sensitive to alcohol. During development, nerve cells are multiplying, moving to their ultimate locations, and forming critical connections with other nerve cells. If alcohol is present, the brain may be smaller because there are fewer nerve cells and the cells that are there may be in the wrong places and/or not making the right connections. An underdeveloped cerebellum commonly results in poor coordination. Overall brain disruption can result in general mental retardation as well as in very specific learning and behavioral disorders.

Fetal Alcohol Syndrome is caused by a woman drinking during pregnancy. Her baby is born with a group of physical and mental birth defects called FAS. Major characteristics of FAS are listed below:

Major Characteristics of Fetal Alcohol Syndrome

Mental Retardation

Fetal Alcohol Syndrome is the leading known cause of mental retardation in the United States. Some characteristics include:

- Mild to severe retardation
- Irreversible condition
- Memory deficits
- Learning disabilities (primarily math)
- Average IQ 68
- Low socialization and communication skills
- Poor judgement
- Behavior problems

Judgment, Concentration and Social Skills

Judgment:
- Often lies, cheats, steals, shows lack of consider ation, and exhibits excessive unhappiness
- Problems with judgement, comprehension, and abstraction
- Unable to understand and predict consequences of behavior

Concentration:
- Periods of high anxiety
- Poor attention span; easily distracted
- Hyperactive

Social Skills:
- Poor comprehension of social rules and expectations
- Few friends/socially isolated
- Cries or laughs easily, often at inappropriate times
- Teasing or bullying others
- May withdraw socially

Deformities and Physical Problems

Deformed Joints:
- Fingers and toes are permanently flexed
- Incomplete rotation of the elbow
- Lower arm bones are fused at the elbow

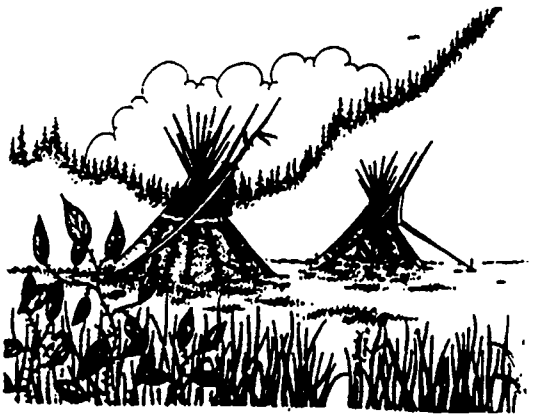
Malformed Facial Features:
- Flat facial profile
- Narrow upper lip
- Vertical groove dividing nose and upper lip is missing
- Short, upturned nose
- Abnormal palate
- Small head and brain
- Small eye openings
- Droopy eyelid
- Abnormal ears - may have "railroad track" ridges

Physical Problems:
- Small head and brain size
- Heart: murmurs, valve defects, narrow pulmonary blood vessels, enlargement of the right ventricle
- Underdeveloped cerebellum: poor coordination, poor reflexes, fine motor control problems
- Growth stunted: Individuals tend to be shorter throughout their lives
- Kidney abnormalities
- Eyes: undeveloped optic nerve (nearsightedness)
- Hip: Dysplasia (abnormal development)
- Absence of olfactory bulbs (poor sense of smell)

Our Community

- In the United States, at least 5,000 infants are born each year with FAS, or approximately one out of 750 live births.
- Studies conducted on specific Indian reservations have shown rates of FAS to be as high as 1 out of 99 live births. However, many people in Native communities do not drink. FAS is <u>not</u> a problem among sober populations.
- Most FAS individuals are not independent in terms of housing and/or income. (In 1989, the institutional and medical costs for one child with FAS are $1.4 million over a lifetime.)
- Schools are affected by the increase in FAS students who need special education services.
- The leadership in a community is affected due to the increase in mental retardation among its citizens and prospective/future leaders.
- The total cost to the US from FAS problems has been estimated at $321 million per year.

See FAS materials for additional information about Fetal Alcohol Syndrome.



The Imperfect Circle

adapted from a story by Stella Logan (Oglala Sioux)

The mountain air was very clear. The leaves were red and yellow. Berries were huge, roots were succulent and garbage at campsites was plentiful. Bear ate and ate because she was pregnant and knew that during hibernation she would need lots of milk for her cubs.

When the snows began to fall, Bear became very tired and went to her cave to sleep. But before she slept, Mother Bear ate something that made her sick and harmed her growing cubs. Heavy with food and her pregnancy, sleep was all she could think of. Soon the snow was very thick over the place where Bear slept. Halfway through the cold moons, while Bear still slept, two bear cubs were born. But Mother Bear slept on, deep in her cave, deep under the snow, deep in the mountains.

The cubs crawled to Mother Bear's belly and nursed her milk. Neither baby bear had a very good appetite. Unfortunately, their mother's milk contained some of the poisons in her system. Instead of Bear's milk making the cubs healthier (as it would coming from a normal, healthy mother), the contaminated milk affected her young even more. Both slept a lot as bear cubs always do, but they did not grow strong.

After another moon passed, the snow started to melt, signaling the beginning of spring. Mother Bear began slowly waking up. As she woke, she became more aware of her cubs as they played all over her big body. Littlest Bear did not have much energy and even though he played, it was not for very long, which is unusual for bears. He didn't eat much and neither did Sister Bear.

When spring finally arrived, Mother Bear sat up and poked her nose out of the cave. The sun was shining and the air was warm. Much of the snow was gone. When Mother Bear waddled out of the cave, she blinked in the bright light. Mother Bear had not eaten since last fall and she was hungry. The cubs followed after her as she began foraging for food. But Mother Bear was not well and neither were her young. Bear noticed that her two young ones were smaller than usual. They were glad to stay close to Mother Bear and did not seem to have as much curiosity as her previous cubs. When she taught them where to find berries or how to avoid bees, the cubs didn't always listen. Mother Bear became worried because they weren't learning life-preserving lessons fast enough.

In all the land, Bear is known as a "protective" mother. She is fierce and strong but she is also loyal and loving. Bear is a powerful animal and an excellent parent. As with bears, human parents want to help their babies when something is not right. But sometimes, when mothers and fathers are affected by poisons because they ate or drank something harmful, they cannot help their babies or themselves.

And so it was with Mother Bear. She could not help her young and she was sick too. They wandered through the mountains and all who saw them cried for them. The trees moaned. The streams flowed rivers of tears. The eagle overhead screeched in agony for the bears. The Winds of the Four Directions howled through the pine boughs. Everyone was sad, for nothing could ever overcome the harm from the poison Bear had eaten. Nothing could ever make the bear cubs healthy.

CRITICAL CONCEPTS:
Prior to beginning this unit, students must have familiarity with the following skills:

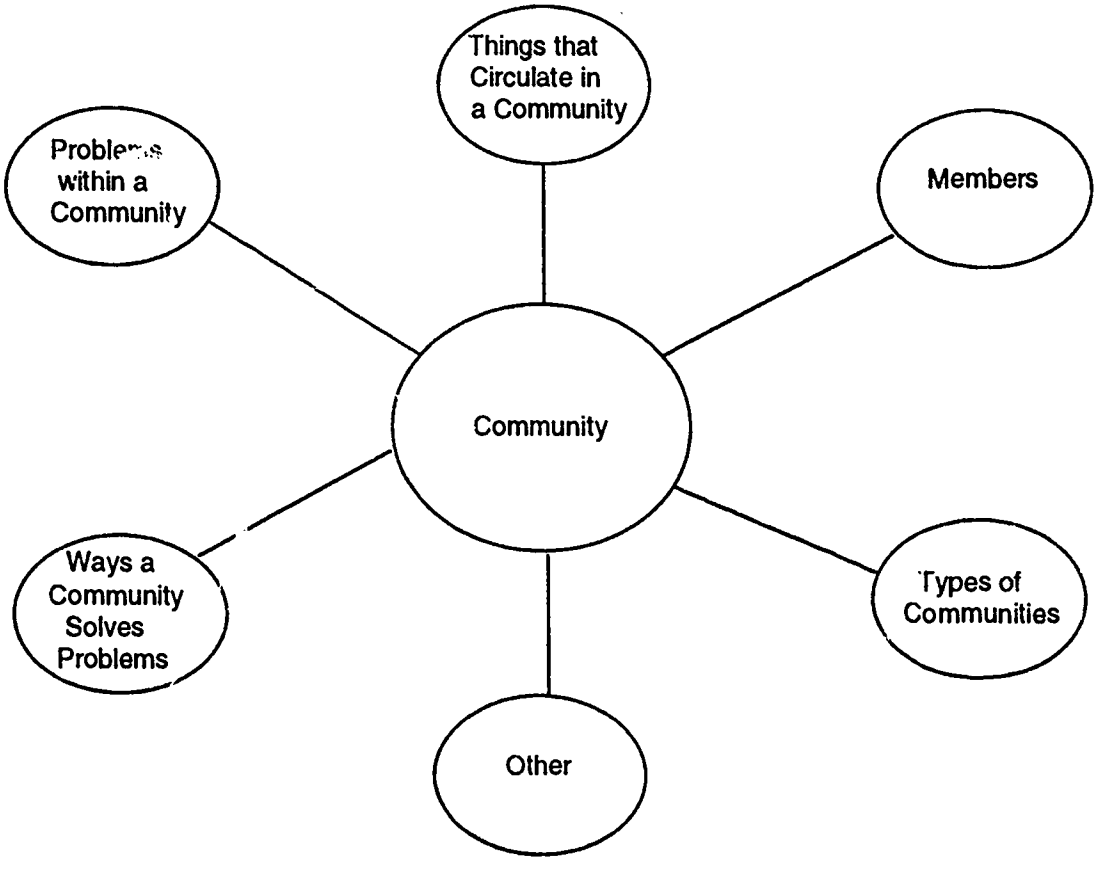
1. *researching*
2. *working in a cooperative group*
3. *interviewing people*
4. *journal writing*

TEACHER PREPARATION: *Become familiar with the research guide and establish a process that aids the students in completing it. Designate an area in the classroom where the enclosed FAS pamphlets, posters, and bumper stickers can be displayed and read. These materials should be available to the students throughout the course of this study.*

When involving community members in this curriculum, and you are unfamiliar with the local community, it is important to consult with a long term community member to help you identify possible participants. This community member may be able to ask the guests on your behalf. Community members could be any of the following: community health representatives, school faculty, school support staff, or tribal government officials.

A. COMMUNITY AND SCIENCE KNOWLEDGE

1. Begin the unit by placing the following visual on the board or chart paper. Students brainstorm ideas related to the topic of community. Record these responses on the visual.



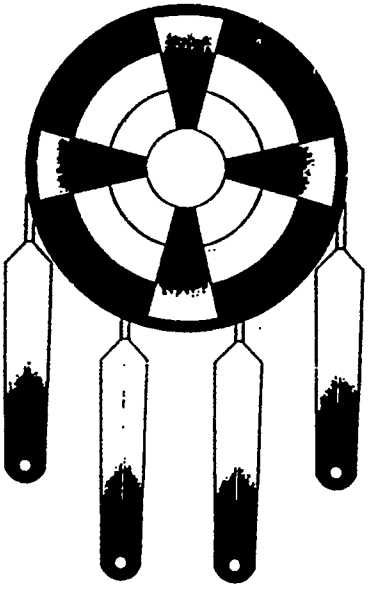
2. Inform students that some community members will be involved in helping them study this unit. Using ideas generated from the visual, help students generate questions which they want to ask community members about their community.

3. Students break into groups of 4 to generate specific questions.

4. Teacher helps students clarify questions. Questions are copied and given to students.

5. Provide students the opportunity to ask community members their questions. (This may include bringing community members into the classroom, having students go out in the community, discussing these questions with family members or significant others.) Students document their responses.

6. Students share their findings. This includes:
   - What questions they asked the community members?
   - Who they talked to and why?
   - What they learned about their community?
   - How is this information useful?



B. THE STORY

1. Identify a community member to share the story, "The Imperfect Circle." The story should be adapted to fit the students' culture and community.

2. Share the story with the class and discuss things that a human mother might take when she is pregnant that could hurt her baby.

3. After presentation of the story, students may retell or respond to the story in creative ways, including murals, role playing, creative writing, etc.

C. DETERMINING BACKGROUND KNOWLEDGE: Prior to beginning the activities, ask the following questions:

1. What do you know about how alcohol affects a developing baby?
2. What do you know about fetal alcohol syndrome?

Record the students' responses on a chart or chalkboard. Allow students to add information to the chart throughout the unit.

D. VIDEO "BABIES-IN-WAITING"

1. Show the video and discuss the following questions:

-What are the most important things a mother can do to have a healthy baby?
-What advice was given to each of the mothers?
-How can fathers help make sure that the baby will be healthy?
-Which father in this video did the best job of protecting his baby's development?
-Did friends have any influence on the development of the babies?

E. FAS MATERIALS

For additional information on FAS, students review the FAS booklets, pamphlets and posters as they consider the following: What FAS topic would you like to learn more about?

F. TOPIC GENERATING SESSION

After the students have reviewed the FAS materials, ask the following questions and record their responses on a large sheet of butcher paper.

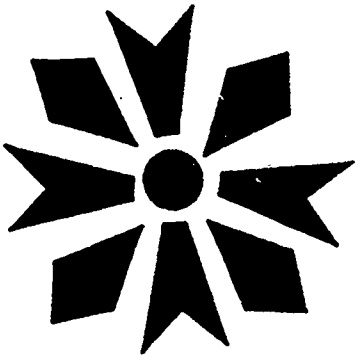
1. What did you see or read that surprised you?
2. What looked interesting to you?
3. What areas would you like to learn more about?
4. From the FAS materials, what touched your heart?
5. What FAS topics could you research in your community? *(Community issues are critical to this study.)*

G. RESEARCH

1. Upon completion of the topic generating session, allow the students to select an area that interests them from the list of FAS topics. *(Students will complete their research in pairs. These pairs may be formed prior to selecting a topic on the basis of common topic interest.)*

2. Once a FAS topic has been selected and pairs formed, distribute one research guide to each pair.

3. Review and explain the research guide. Have each pair write the topic of their study on the form, and then generate two questions they wish to answer related to their topic. Review these questions with each pair.



4. Using the "Sources of Information" list, students will identify at least two potential sources to answer each question. Assist the students as necessary.

5. Once the pairs have identified their topics, questions and sources for answering the questions, the pairs will begin to respond to the remaining items on the research guide. The process that you want the students to follow to complete the rest of the research needs to be discussed at this time. This may include:
   - consulting resources
   - how frequently you will review the research guide
   - amount of time given to complete the research
   - other expectations that you have regarding the completion of the research

6. Students complete items 2-13 on the Research Guide. The "Ways to Share Information" form may stimulate the students' creativity in presenting their topics.

H. SHARING SESSION

Students share what they have learned about the effects of FAS on an individual and a community. Audiences may consist of other classmates, primary age students and\or community members.

I. **UNIT REVIEW ACTIVITIES:** Select one or more of the following to reinforce concepts explored in the unit.

1. In small groups, have the students design their own acrostic for the words, "Fetal Alcohol Syndrome." In addition to factual information, students should make references to "The Imperfect Circle." A sample is provided, but your class will be much more creative.

F athers play an important role

E very child needs a community's care

T he leading cause of mental retardation

A lcohol consumption during pregnancy

L earning problems

A preganant woman never drinks alone

L ove and care to all community members

C aution: occupant - no drinking

O ne out of 750 live births

H arm to cubs

O bject when pregnant women drink

L abel all alcohol as dangerous to the fetus

S maller in size

Y ear 1973

N o cure

D eformities

R emain drug free

O pen a carton of milk, not a can of beer

M other Bear was sad

E ach life is precious

2. Ask students to work in small groups to answer the question, "What have we learned about FAS and how it affects a community?" Add responses to the chart from the beginning of this unit. Use this to review the concepts addressed in this unit.

J. **POST ASSESSMENT:** Each individual student completes the following task:

In your own creative way show what you have learned about how Fetal Alcohol Syndrome affects an individual and community.

See "Ways to Share Information" page for ideas.

VOCABULARY:
Concentration: the ability to focus your attention
Deformities: changes in the natural form or part of an organ
Fetal Alcohol Syndrome (FAS): a birth defect caused by alcohol consumption by the mother while pregnant
Mental Retardation: below normal intelligence
Judgment: ability to make decisions
Social Skills: ability to converse, work with people, make friends, and adjust to changing situations.

MATERIALS: Select the materials that are appropriate for your class from the list below.

Pamphlets/Information Sheets

"Advice for Indian Woman for a Safer Pregnancy and Healthier Baby" - includes a basic list of Do's and Don'ts from the National Indian Fetal Alcohol Syndrome Project.

"Alcohol and Pregnancy" - lists the physical and mental characteristics of FAS and FAE, from the National Indian Fetal Alcohol Syndrome Project.

"Alcohol and Pregnancy: Choices for the Future" - defines FAS and FAE, describes the characteristics of FAS babies and the choices a woman can make.

"Breast Feeding and Alcohol (AISES)" - describes how alcohol affects a baby through breast-feeding.

"Fetal Alcohol Fact Sheet" - defines FAS and FAE, gives statistics, encourages preventative measures, and includes several hotline numbers.

"Fetal Alcohol Syndrome (AISES)" - defines FAS and lists ways FAS affects a baby, from a Native American perspective.

"Great Expectations: Information about Drugs and the Unborn Child" - gives the risks of drug use during pregnancy, including alcohol, tobacco, marijuana, etc.

"Making the Right Choices: The Facts about Drugs and Pregnancy" - gives facts and encouragement to make healthy choices while pregnant.

"Men, Alcohol, and their Babies" - stresses the importance of male sobriety - both to the unborn child and to the woman.

"National Indian Fetal Alcohol Syndrome Program: Program Description" - describes the goals and objectives of this program, which was re-established in 1991.

"Possible Effects of Alcohol on an Unborn Child" - discusses 4 aspects of FAS: mental retardation, deformities, judgment, and community.

"Protect our Future: Prevent Fetal Alcohol Syndrome" - from the White Mountain Apache Tribe, a pamphlet with good visual depictions of the effects of FAS.

"Ten Common Misconceptions about FAS and FAE" - lists 10 widely believed myths and the facts that dispel them.

"Three Words about Drinking while Pregnant: Don't Do It!" - stresses the mother's health in relation to the baby; gives hotline numbers for quitting drinking.

"What Can a Man Do to Help His Wife and Unborn Baby?" - lists four suggestions for men to help future mothers have healthy pregnancies; from the National Indian Fetal Alcohol Syndrome Project.

Booklets

"Fetal Alcohol Syndrome (Hazelden)" - a detailed guide to the history and symptoms of FAS; included is a case history.

"Fetal Alcohol Syndrome Resource Guide" - lists videos, pamphlets, legislation, and agencies within different regions.

"Have You Heard ... About Alcohol and Pregnancy" - Defines FAS, has a questionnaire that identifies at-risk behaviors, discusses healthy ways to get "high," gives examples of pressure to drink and ways to avoid these pressures.

"Learn about Alcohol and Pregnancy" - highlights prenatal cares and concerns.

"A Manual on Adolescents and Adults with Fetal Alcohol Syndrome with Special Reference to American Indians" - this U.S. Dept. of Health & Human Services manual is directed to those who provide care or services to adolescents and adults with FAS or FAE. Although primarily useful to the teacher, this may also be a good reference for mature students.

Posters

"An Inner Voice" - illustrates traditional Indian values.

"Honor the Circle" - illustrates the values concerning the family, tribe and earth.

Bumper Stickers

"Face It: Drinking Alcohol During Pregnancy May Cause Birth Defects"

Research Guide

Topic: _____

1. Write at least two questions about things you would like to learn on this topic and where you could find this information.

Questions	Who could I ask or where can I get information?
A.	_____
	_____
	_____
B.	_____
	_____
	_____

2. Why would the answers to these questions help an individual have healthy children or mother bear have healthy cubs?

3. Notes - information gathered about your two questions.
(Remember, notes do not have to be in sentence form.)

Question A.

Question B.

4. Using the information you've gathered, answer each question in your own words.

Question A.

Question B.

5. In the story, "The Imperfect Circle," why were the cubs born unhealthy? How is this story like a story about an unborn child and alcohol?

6. How would a person's life be different if alcohol had hurt that person before birth? Include your topic in this answer.

7. What did you learn about the effect of FAS on your community?

8. What can a mother do to prevent FAS?

9. What can a father do to prevent FAS?

10. What can you do to prevent FAS in your community?

11. List at least two topics that you find interesting and may want to research further.

12. How would others in your class/community benefit from knowing about your topic?

13. Sharing is a traditional Indian value, and, knowledge is highly respected in the Indian culture. You have gained knowledge about FAS, and now the time has come toshare your knowledge with your community. Use the space below to plan how you will share what you have learned to help others become informed about the dangers of alcohol and pregnancy.

How Can we Get Information to Answer our Questions?

Documents

- atlases
- biographies
- electronic media
  - -audio-cassettes
  - -filmstrips
  - -records
  - -video-cassettes
- encyclopedias
- magazines
- scientific books
- textbooks

Surveys/Questionnaires

- attitudes
- experiences

Interviews

- within school
  - -administrators
  - -students
  - -teachers and aides
- within community
  - -alcohol and drug prevention staff members
  - -elders
  - -grandparents
  - -health care professionals
  - -neighbors
  - -parents
  - -social service agencies
- outside of the community
  - -college professors
  - -business people
  - -tribal-government workers

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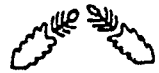
Ways to Share Information

block picture story

play

word search

mobile



flannel board story

photograph

sculpture

skit

rebus story

illustrated story

triangle poem

radio program

advertisement

interview

book jacket

graph

puppet show

transparency

letter to the editor

scrapbook

filmstrip

triplet

riddle

picture dictionary

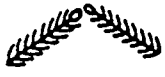
game

collection

newspaper article

poem

booklet



survey

journal

labeled diagram

vocabulary list

prayer

chart

map

jigsaw puzzle

greeting card

poster

fact file

demonstration

collage

diorama

tapes

How Does Alcohol Affect the Brain and Community?

An Interdisciplinary Approach to the Study of the Science of Alcohol for Upper Elementary and Middle Level Students

SACAI Unit Four

American Indian Science and Engineering Society
1630 30th Street, Suite 301
Boulder, CO 80301

Post Assessment - Teacher
How Does Alcohol Affect the Brain and Community?

Teacher: _____

School/State: _____ _____

Grade Level(s): _____

Percent American Indian in School/Tribe(s): _____ _____

Number of Classes/Students: _____ _____

1. In what ways did the community members help the students in understanding the problem of alcohol in the community?

_____

_____

2. In what specific ways did the curriculum challenge the students to use their critical thinking and problem solving skills?

_____

_____

3. How did the students demonstrate creativity in compieting the Post Unit Assessment Activity?

_____

_____

4. What instructional adaptations did you have to make to successfully teach this unit?

_____

_____

Write Additional Comments on Back.

Return the completed form to the SACAI project:

AISES
1630 30th St., Suite 301
Boulder, CO 80301

Post Assessment - Student
How Does Alcohol Affect the Brain and Community?

Grade: _____

Circle the number that tells how you feel about each item.

1 = strongly disagree
2 = disagree
3 = agree
4 = strongly agree

1. The community members helped me to understand the problems with alcohol.

   1 2 3 4

2. I have a better understanding of how alcohol affects my body.

   1 2 3 4

3. I liked the activities in SACAI.

   1 2 3 4

4. I think other students my age should study SACAI.

   1 2 3 4

5. What I like best about SACAI is: _____

   _____

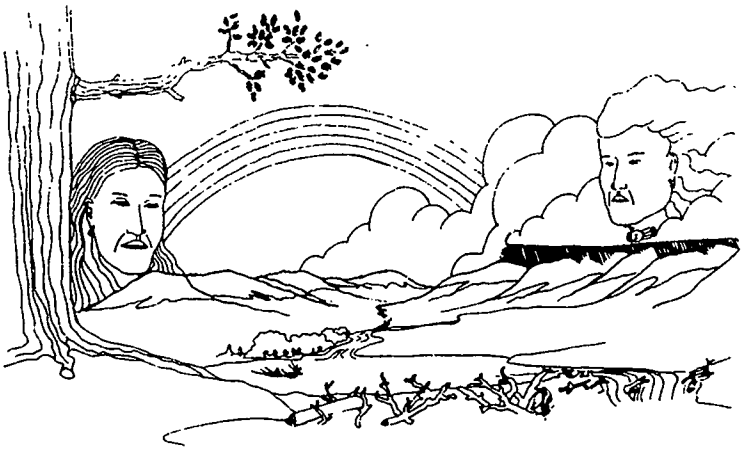
6. What I like least about SACAI is: _____

   _____

Return the completed form to the SACAI project:

AISES
1630 30th St., Suite 301
Boulder, CO 80301

How Does Alcohol Affect the Brain and Community?



Holistic Statement: The brain is divided into three major dependent regions which rely on each other for normal functioning. When alcohol enters the body the brain is affected in several ways. This unit focuses on how alcohol slows brain functions in terms of thinking and reaction time. The brain, like a community, must function as a whole, linking its three major regions to create a healthy human mind. Alcohol affects the entire brain, like the characters' actions in the story. They disrupt the healthy state of Sky, Earth, and Beings much in the same way that alcohol disrupts the balance between the cerebrum, cerebellum and medulla.

Unit Goal: The purpose of this unit is to study how alcohol affects the brain and how alcohol-impaired functioning affects the body and community.

Unit Outcomes: The students will:

- describe the effects of alcohol on the brain's functions of bodily movement and thinking;
- describe the purpose and function of a community;
- explain how alcohol affects the body and the community.

Unit Assessment: The Post-Unit Assessment and unit activities are designed to provide ongoing assessment as students complete the tasks and associated response forms.

Interdisciplinary Connections: This curriculum emphasizes the application of interdisciplinary skills and knowledge in the study of the science of alcohol. This includes use of the following skills in integrative ways: critical thinking, problem solving, reading, writing, mathematics, and community learning.

Journal: The journal is to be used as a problem-solving tool for students and teachers as they reflect on what they learn and set down their feelings in words. Writing in the journal serves as a way to clarify thoughts, feelings, and learning and should be shared with others at the discretion of the writer. Sharing of journal entries by both students and teachers enhances the concept of community. Journal entries may be made at any time throughout the unit. However, some of the suggested times are indicated in the unit by the symbol

SACAI Sharing Box: SACAI and related topics are sensitive issues; students may have trouble speaking out in class about their concerns. Using a sharing box allows the students to voice their concerns or questions in an anonymous, non-threatening way. Students may ask any questions or make any statement they wish about alcohol and their lives through the sharing box. Set aside class times to discuss sharing box items and seek the assistance of community members for responses to items you do not know.

Content Summary

Science Background Summary for the Teacher:

The brain has an important role in making each of us who we are. It shapes our intelligence, personality, memory, emotions and our ability to interact successfully with the outside world. Most remarkably, the brain integrates these many capacities into a single human being. Because the brain is so important, damage to it can profoundly affect a person's life.

The brain is an extremely complex organ, and even after years of intensive study, only a limited understanding of brain activity has been achieved. The thought processes involved in concept formation, abstract reasoning, learning, and memory have largely proved elusive to researchers. It does appear, however, that no area or structure of the brain acts entirely on its own. The removal of portions of the brain or the severing of tracts in the brain, both of which have been done experimentally in animals or as the result of trauma in humans, reveal that the most complex higher functions of the brain are generally whole-brain functions. Often, the results show that more than one area can control a specific function. This means that each area of the brain is probably involved in many functions. Even those functions that occur automatically are generally the result of input from several different sources. Thus, the functions attributed to particular regions or structures of the brain are meant to serve only as general references. For the purpose of studying the effects of alcohol, the structures cerebrum, cerebellum, and medulla are discussed specifically.

The medulla is the oldest portion of the human brain and is located at the base of the brain. It looks and works much like the brains of other vertebrates (animals with backbones). It automatically controls breathing, heart rate, swallowing, and other body functions necessary for life. It also controls some reflex actions, including gagging and vomiting. The medulla works when a person is sleeping or unconscious.

The cauliflower-like cerebellum is located above and behind the medulla. The cerebellum receives information from the body regarding tension in the muscles and tendons and positions of joints, as well as visual and equilibrium data. This information allows the cerebellum to determine where the body is and where it is going. Using this information, the cerebellum determines the best way to coordinate muscles, maintain posture, and ensure smooth, balanced, coordinated movements.

The cerebrum is the seat of all conscious activity. The cerebrum is the largest part of the brain, making up about 80% of the total brain mass. The cerebrum enables us to perceive , communicate, remember, concentrate, understand, appreciate, judge, memorize, and reason. All of our senses are interpreted and understood by the cerebrum. It is also responsible for the personality and attitudes of a person.

Alcohol Information Summary for the Teacher:

Once in the bloodstream, alcohol is distributed throughout the body by simple diffusion. Due to its molecular structure and the fact that is mixes easily with water, alcohol is able to pass through cell membranes and mix with the blood. Within minutes after alcohol passes into the bloodstream, the brain, liver, heart, pancreas, lungs, kidneys, as well as every other organ and tissue system, are infiltrated.

Alcohol slows and disrupts the activity of the brain and nervous system at all levels because it affects individual nerve cells that make up the brain. Alcohol affects nerve cells by dampening, or inhibiting their activity. By inhibiting all brain activity, all behavior is affected, including the processing of incoming sensory information, communication between different brain structures, and outgoing motor activity. The more a person drinks, the greater the disruption of the nervous system. Chronic alcohol use results in structural changes in the brain that can lead to permanent memory impairment, seizures, and death.

Typically, as alcohol affects the cerebrum, the complex processes of reason, judgement, and fine discrimination are the first to disappear. Thinking gets progressively more difficult. Information processing gets disrupted and concentration becomes difficult.

The cerebellum begins to show the slowing and disruptive effects of intoxication. Coordination and a sense of where the body is located in space also become impaired. Intoxicated people often break things and stumble as they walk because of disruptions in the cerebellum. Words are slurred because the neural input to muscles in the mouth is affected.

If alcohol levels continue to increase, the medulla is eventually affected. When this happens, drinking can be life threatening. Alcohol can sedate the medulla causing the heavy drinker to pass out, i.e., fall into an alcohol-induced coma. An inexperienced drinker, whose nerve cell membranes have not adapted to alcohol, can die if enough alcohol is ingested to completely disable the medulla's breathing center.

The Circle of Life

by Abbie Willetto (Navajo)

It was a cool summer morning, the grass swayed in the gentle breeze and the stream talked to itself as it went winding down the mountain, pushing toward the sea.

The days had grown shorter as Mother Earth slowly tilted her position away from the sun. Soon autumn would arrive bringing with it cold frosty mornings and leaves blazed with color.

A small mountain community had endured the Earth's seasons for centuries. The living creatures worked together so that all could share the shelter of the Earth. Within each season certain life processes were carried out. Plants grew, died and released their seeds to the wind to be planted elsewhere in order to continue the circle of life. Animals raised their young in the meadows, forests and water.

The universe lived in harmony. The Sky provided the motion forces which turned the Earth, changed the seasons, and moved the oceans. It guided the Beings to their destinations by the stars it hung across itself. The Earth, mother of all Beings had patiently provided the environment necessary for the basic survival of species since time began. There was land for the land dwellers and clear water for the water dwellers, and air to breathe. She did this so that each plant and animal being had its own place to live and carry out its life cycle.

The Beings valued their Earth and Sky. They were the thinkers. They tried very hard to follow the advice given to them by their leaders. The leaders counseled the community members regularly. Badger, a land animal leader said to them, "We must live in harmony with our Mother Earth and Father Sky, for we are their children and we must take care of what they have provided for us. Your daily actions cannot be taken lightly, for they touch all of us." For several centuries the beings lived in harmony with the Sky and the Earth. Each community living by the teachings of their leaders. Fish, leader of the water beings spoke, "We must learn about each other since we share the same home. We need to learn from one another to survive." The oldest pine tree also spoke, "Please take only enough of my seeds to feed yourselves and your families. Let some seeds fall from your mouths so that you will have more pine trees to eat from and take shelter in."

This balance between Sky, Earth and Beings was important, for if this balance was disturbed the disruption would be felt not only in the place where it started, but throughout the entire universe.

On that cool summer morning a group of land beings rose up and placed themselves above the other creatures. They were the Humans, their rebel leader said, "We are tired of the cold winters, we do not want to work in the hot sun day after day during the summer making ready for yet another cold winter. We want to change our lives and enjoy ourselves more." Some of the human beings went up against their former leaders teachings and began manipulating the Earth to serve only their needs. They ignored the cries of the other living creatures.

Blue Cloud, the rebel leader directed his followers. They dammed up a river and made a huge lake so that they would not have to walk so far to get water. They cut down many trees to build large shelters, leaving behind unprotected smaller plants and loose soil. They did not take care of the newly formed lake or the land surrounding it. The lake became polluted as more and more humans came to the lake in hopes of having an easier life. Many other land creatures began to drink from the lake because the streams they used to drink from had been flooded by the dam. Many began to get sick, and slowly, slowly, many of them disappeared, never to walk on their mother again. The greedy Beings began to squabble, not satisfied with the changes they had made. Blue Cloud said, "We must make a big fire so that the winter will not bother us, and we will stay warm all winter long." So they created a huge fire made with the black stone found under the skin of the Earth. They built the fire so large that the smoke blocked out the sun's light. Little by little they disrupted the balance between Sky' Earth and Beings. The rain that fell was the tears of the Sky and Earth; they cried for their children whom they no longer had; they cried for the Beings who disregarded them. The tears of rain which fell carried the smoke from the fire and covered the land with a gray layer, which sickened the plants and made them weak. This rain further polluted the lake and streams.

Slowly, slowly, life changed. The Sky became gray. The Earth became unfit to live on and the Beings, weak from sickness, cried out to their leaders to save them. "I can no longer provide food for others and seeds for future generations," said Pine Tree. "We must work together to change what has happened."

The leaders held counsel and thought about the problems facing the Beings, Earth and Sky. They determined that the Beings had disobeyed the teachings. Fish said, "For each action there is a consequence which affects all parts of the circle of life. The Sky must work with the Earth and the Beings which live on her crust. In turn, the Earth must live in harmony with her children and the Sky which surrounds her." "Most importantly," said Badger, "We, the living Beings who make our home here, must take care of our Mother and Father, so that they will live to care for us all as they have done for centuries."

CRITICAL CONCEPTS:

Prior to beginning this unit, students must have mastery of or familiarity with the following concepts and skills:

1. *functions of the cerebrum*
2. *functions of the cerebellum*
3. *functions of the medulla*
4. *working in a cooperative group*
5. *journal writing*

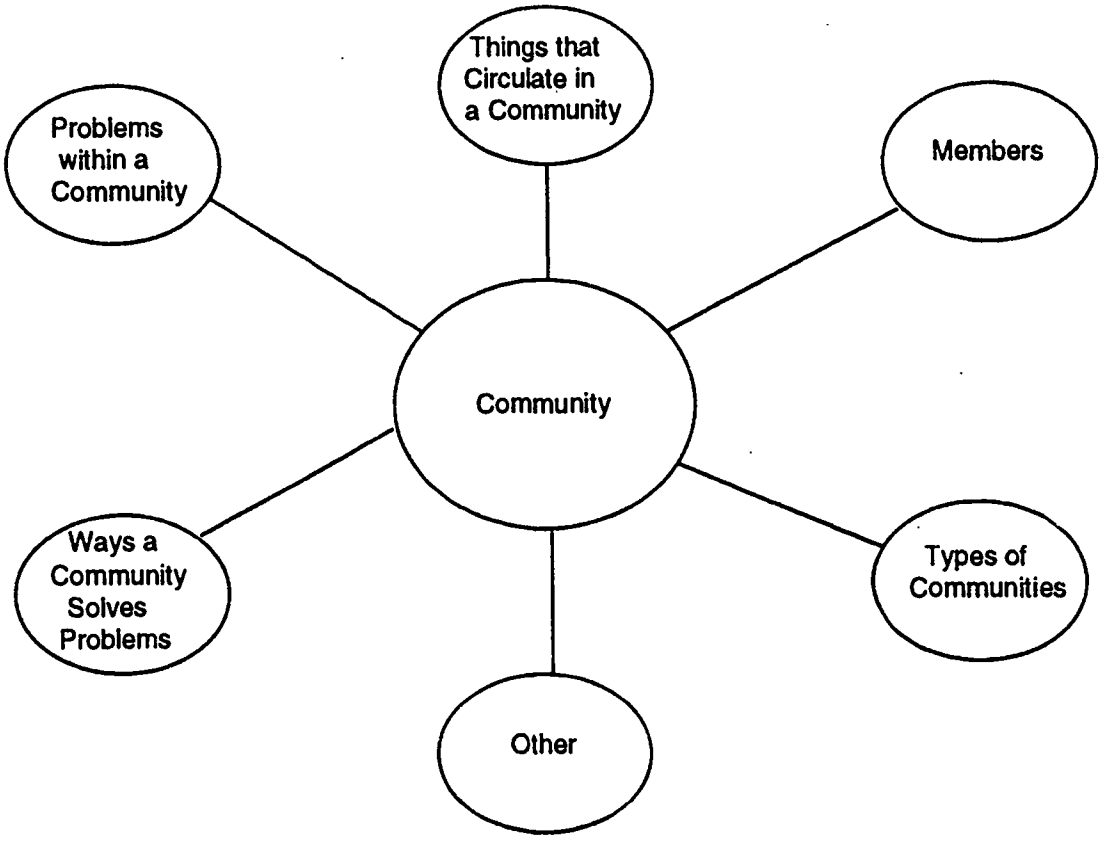
TEACHER PREPARATION:

Display the Nervous System poster where it can be referred to throughout the unit. Gather materials needed for each activity and duplicate response forms.

When involving community members in this curriculum, if you are unfamiliar with the local community it is important to consult with a long term community member to help you identify possible participants. This community member may be able to ask the guests on your behalf. Community members could be any of the following: community health representatives, school faculty, school support staff, or tribal government officials.

A. COMMUNITY AND SCIENCE KNOWLEDGE

1. Begin the unit by placing the following visual on the board or chart paper. Students brainstorm ideas related to each topic of community. Record these responses on the visual.



2. Inform students that some community members will be involved in helping them study this unit. Using ideas generated in the above activity, help students generate questions which they want to ask community members about their community.

3. Break students into groups of four to generate specific questions.

4. Help students clarify questions. Questions are copied and given to students.

5. Provide students the opportunity to ask community members their questions. (This may include bringing community members into the classroom, having students go out in the community, discuss ing these questions with family members or significant others.) Students document their responses.

6. Ask students to share their findings. This includes:
   - What questions did they ask the community members?
   - Who did they talk to and why?
   - What did they learn about their community?
   - How is this information useful?

B. THE STORY

1. Identify a community member to share the story. The story should be adapted to fit the students' culture and community.

2. Present the story, "Circle of Life", with the following questions for students to consider as the story is being presented:
   -How do Earth, Sky, and Beings (living things) work to maintain a healthy environment?
   -What happens when this balance is interrupted?

3. After presentation of the story, students retell or respond to the story in creative ways including murals, role playing, creative writing, etc.

C. DETERMINING BACKGROUND KNOWLEDGE: Prior to beginning the activities, ask the following questions:

1. What do you know about the functions of the cerebrum?
2. What do you know about the functions of the cerebellum?
3. What do you know about the functions of the medulla?
4. What do you know about how the three main parts of the brain work together?

Record the students' responses on a chart. Provide time for students to add or change information to the chart throughout the unit.

D. ACTIVITIES

Divide the students into pairs and work with them as they complete the three activities. Pairs work together to complete one response form per activity.

The materials listed provide for one pair of students.

Activity 1: How Does Alcohol Affect Thinking?
1 rubber band
1 sheet of notebook paper
1 sheet of construction paper
10 toothpicks
6" piece of masking tape
2 paper clips
3 paper cups

Activity 2: How Does Alcohol Affect Reaction Time?
a 30 cm or 300 mm ruler

E. **SHARING SESSION:** Students share what they have learned about how alcohol affects the brain and community. Audiences may consist of other classmates, primary-age students, and/or community members.

F. **UNIT REVIEW ACTIVITIES:** Select one or more of the following to reinforce concepts explored in the unit.

1. Have the students work in small groups to create a poem describing the effects of alcohol on the brain and community.

2. Have students work in small groups to answer the question, "What have we learned about how alcohol affects the brain and community?" Add responses to the chart from the beginning of this lesson.

G. **POST ASSESSMENT:** Each individual student completes the following task:

In your own creative way show what you have learned about how alcohol affects the brain and community.

See "Ways to Share Information" sheet for ideas.

Clean Up: Encourage students to make the best possible use of the Creator's gifts by recycling whenever possible.

Vocabulary:

Blood Alcohol Level:	The amount of alcohol present in a person's blood, expressed as a percentage.
Cerebellum:	The part of the brain that coordinates movement.
Cerebrum:	The largest part of the brain and the part that controls thinking.
Medulla:	The part of the brain that controls automatic activities such as heartbeat, breathing, and blood pressure.

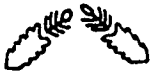
Ways to Share Information

block picture story

play

mobile

word search



photograph

flannel board story

skit

sculpture

rebus story

illustrated story

triangle poem

radio program

interview

advertisement

book jacket

graph

transparency

puppet show

letter to the editor

scrapbook

filmstrip

triplet

riddle

picture dictionary

game

collection

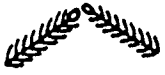
newspaper article

poem

journal

labeled diagram

booklet



survey

vocabulary list

prayer

chart

map

jigsaw puzzle

greeting card

poster

fact file

collage

demonstration

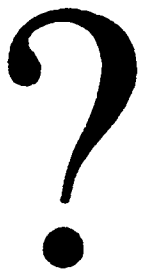
diorama

tapes

Activity 1: How Does Alcohol Affect Thinking?

_____ Names _____

1. Gather the following materials:
   1 rubber band
   1 sheet of notebook paper
   3 paper cups
   a 6" piece of masking tape
   2 paper clips
   1 sheet of construction paper
   10 toothpicks



2. Work together to create an object from the materials listed above. Record any actions used in creating the object on the lines below. Some examples are as follows: tearing a piece of tape, or attaching the rubberband.

_____ _____ _____

_____ _____ _____

_____ _____ _____

3. Once the object has been constructed, determine its use and give it a title.

_____

_____

4. Alcohol affects a person's ability to think clearly. Describe how your object might be different if it was created by someone under the influence of alcohol.

_____

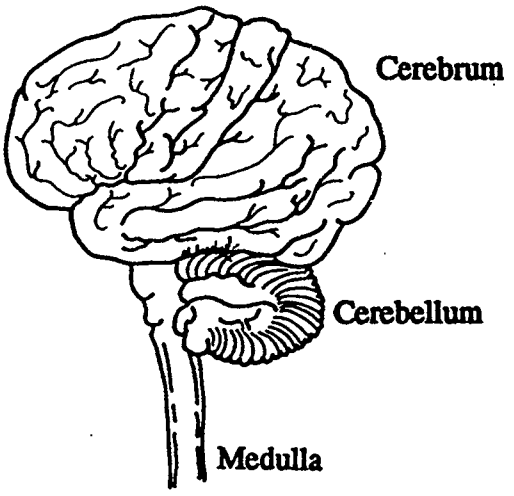
_____

5. Which part of the brain would you say had been most affected if thinking was unclear?

_____

6. Which part of the brain would you say had been most affected if movement was slowed?

_____

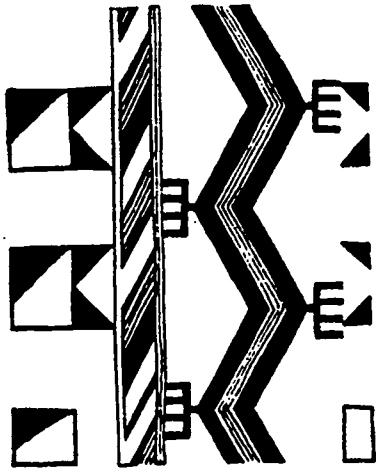


7. Why is the ability to think clearly important as a community makes decisions in trying to solve its problems? (Select 2 problems in your community and show how the influence of alcohol might affect solving the problems.)

_____

_____

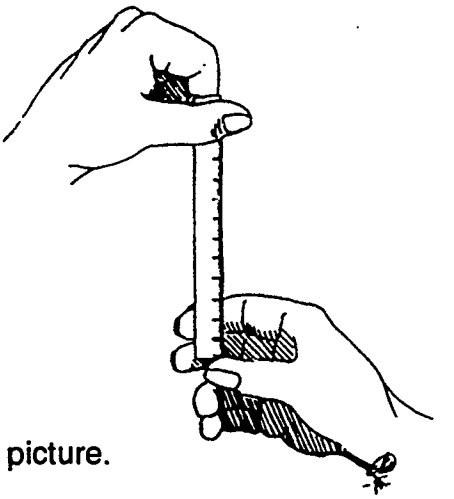
_____



Activity 2: How Does Alcohol Affect Reaction Time?

Names _____ _____

A 30cm or 300 mm ruler is needed for this activity.



1. Why do you think that accidental deaths are the number one killer of adolescents and young adults in the United States?

_____

_____

2. Have your partner hold the ruler at the 30-cm end by the fingertips so that the ruler hangs down as in the picture.
3. Hold your thumb and forefinger at the 0-cm mark, but do not touch the ruler.
4. Without warning, your partner should let go of the ruler. Try to catch the ruler by pinching your thumb and forefinger together. Your thumb will cover a point on the centimeter scale.
5. Record this point on the chart below. If the ruler drops to the floor, record "greater than 30 cm."
6. Repeat the same procedure, only this time spin around several times until you feel dizzy. Immediately try to catch the ruler. Record the results in the chart below.

Student 1	Reaction Time Without Spinning	Reaction Time After Spinning
Trial	1	2
cm mark		

7. Switch with your partner and repeat the process.

Student 2	Reaction Time Without Spinning	Reaction Time After Spinning
Trial	1	2
cm mark		

8. In this activity the greater the distance the ruler fell, the _____ the reaction time.

9. How did the reaction time results compare before and after spinning?

_____

_____

10. Explain how your brain helped you to catch the ruler.

_____

_____

Alcohol, like spinning, can cause a driver to react to situations slowly. The chart below shows the distance required to stop a car at different speeds.

Driving Speed	**Stopping Distance (feet) When Reaction Time Is:**		
	0.75 second (No Alcohol)	*1.5 seconds (With Alcohol)*	*2 seconds (With More Alcohol)*
20 mph	46 feet	68 feet	82 feet
40 mph	140 feet	185 feet	214 feet
65 mph	323 feet	394 feet	441 feet

11. What does this chart tell you about how driving speed affects stopping distance?

_____

_____

12. What does this chart tell you about how use of alcohol affects stopping distance?

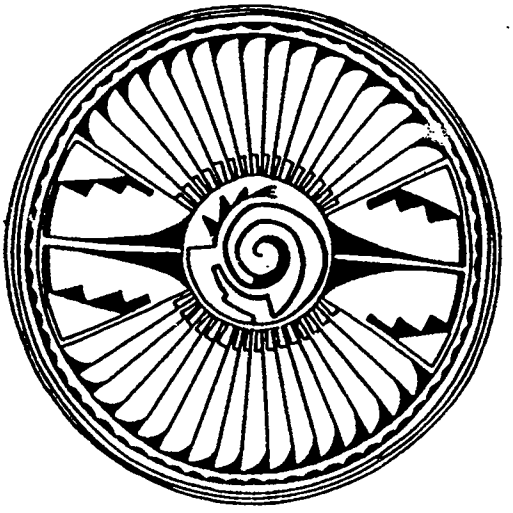
13. Why is a person more likely to be in an accident when they have been drinking alcohol?

14. What are some situations which take place in your community that require a person's body to respond quickly? How would alcohol interfere with the necessary response?

Situations	Alcohol's Effects
1.	1.
2.	2.
3.	3.

Activity 3: How Does Alcohol Affect Thinking and Movement?

Names _____ _____



1. Using what you learned in Activities 1 and 2, answer the following questions:

   a) Explain how alcohol changes a person's thinking abilities.

_____

_____

   b) Describe the effects of alcohol on movement.

_____

_____

2. How would a blood alcohol level of .05% affect a person's thinking and movement abilities in constructing the object you and your partner made?

_____

_____

3. How would a blood alcohol level of .15% affect a person's thinking and movement abilities in constructing the object?

_____

_____

4. In what ways does alcohol's effect on the brain have an effect on how the body works?

_____

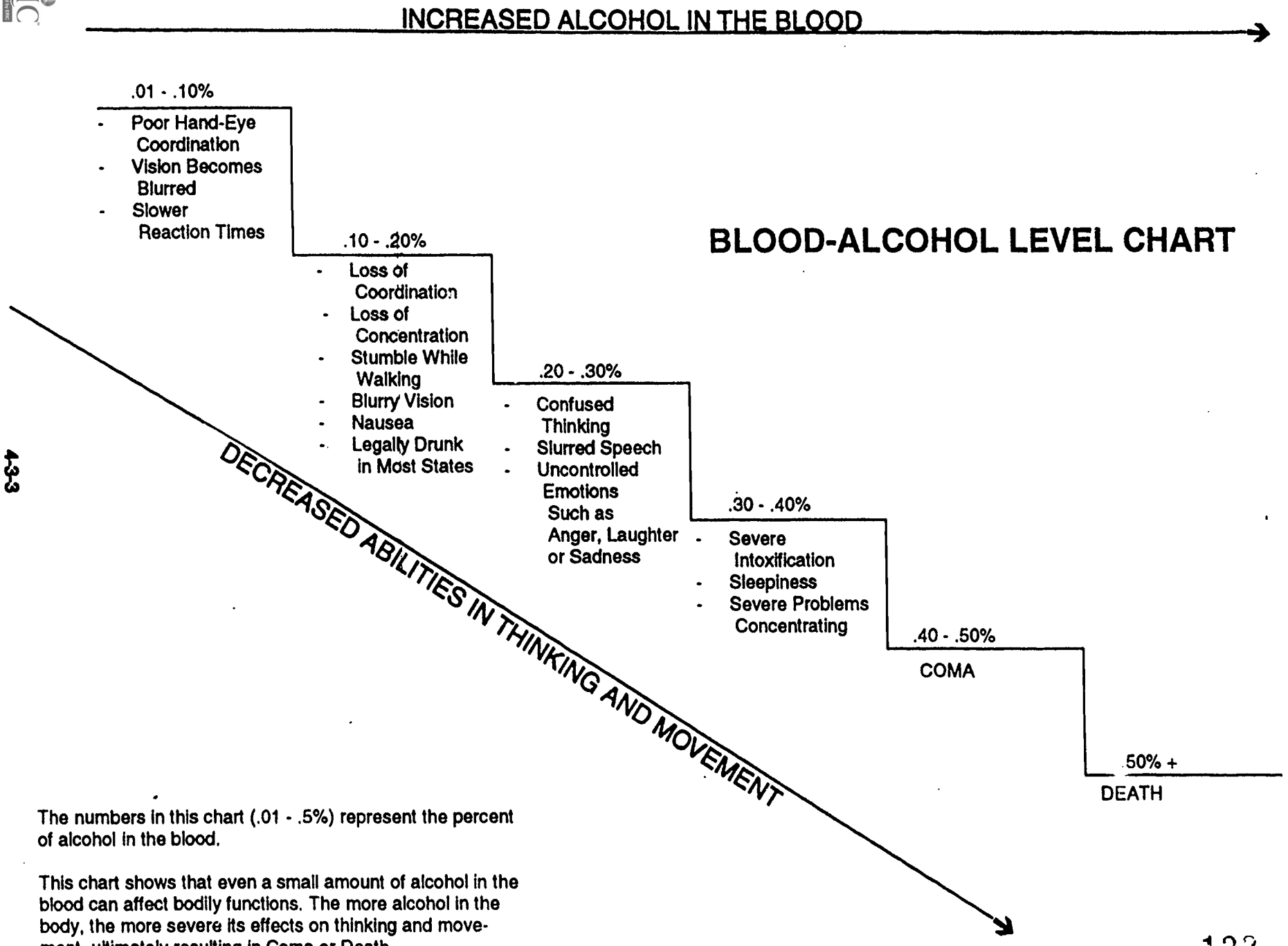
_____

5. In what way does the story "Circle of Life"suggest what happens to a community which is disrupted by the presence of alcohol?

6. How would you advise the "Beings" in the story to bring balance back into their lives?

7. Explain how the Earth, Sky, and Beings had to work together to create one universe. How is this similar to the three major areas of the human brain working together?

BLOOD-ALCOHOL LEVEL CHART



The numbers in this chart (.01 - .5%) represent the percent of alcohol in the blood.

This chart shows that even a small amount of alcohol in the blood can affect bodily functions. The more alcohol in the body, the more severe its effects on thinking and movement, ultimately resulting in Coma or Death.

How Does Alcohol Affect the Brain and Community?
Answer Form

Activity 1: How Does Alcohol Affect Thinking?

5. (cerebrum)

6. (cerebellum)

Activity 2: How Does Alcohol Affect Reaction Time?

8. (slower)

9. (Reaction time was much slower after spinning.)

10. (The brain helped me to think and move my muscles.)

11. (Increased driving speed increases stopping distance.)

12. (Alcohol slows reaction time which increases stopping distance.)

13. (A person cannot respond quickly to situations and driving is limited.)

14. Situations: (auto accident) Alcohol's Effects: (Immediate medical attention is not given.)

Activity 3: How Does Alcohol Affect Thinking and Movement?

1. a. (A person's thinking becomes unclear.)

   b. (Alcohol slows movement and makes it less coordinated.)

2. (The person may have difficulty using the materials and focusing on the task.)

3. (The person may feel sick and have little control over their movements.)

4. (Alcohol interferes with a person's ability to concentrate and think clearly. Movements are slowed and coordination decreases. This affects everything a person does.)

5. (The Human Beings disrupted the balance between Earth, Sky and Beings by making the water and air polluted. This affected everyone. In a community, everyone feels the disruption caused by alcohol, not just the person who is drinking.)

6. (Think about the consequences of your actions before you carry them out.)

7. (The three parts of the brain work together to form one individual. The Sky controls the Earth's movement, like the brain's cerebellum. The Earth maintained the Beings' environment, like the medulla does for the body. The Beings were the thinkers, like the brain's cerebrum.)

Activity 4: Blood Alcohol Level: Why Do Small Numbers Mean a Lot?

1. (Alcohol enters the bloodstream through the capillaries in the mouth, stomach, and small intestine.)
2. (Answers will vary.)
4. (Motor functions like walking, hand/eye coordination, and reaction time are affected.)
5. (.4%)
6. (Alcohol affects a person's judgement, vision, reflexes, and the ability to concentrate.)
7. (This varies from state to state.)
8. (Answers may vary.)
9. (Participating in a pow wow, sporting event, or school function)

How Does Alcohol Circulate through the Body and Community? Review

1. (Arteries carry blood away from the heart and veins carry blood to the heart. Capillaries connect arteries and veins. Capillaries bring oxygen and nutrients to the body's cells and carry away wastes.)
2. (Oxygen and nutrients diffuse into the cells. Wastes diffuse out of the cells into the blood. Without nutri ents, oxygen or with a build up of wastes, the cells would die.)
3. (Alcohol mixes very easily with water, and blood is 50% water.)
4. (Diffusion occurs in the capillaries because the capillaries are very thin.)
5. (Alcohol mixes easily with blood and diffuses through capillary walls to every cell in the body.)
6. (driving accidents, inability to function, coma or death)
7. (Identify community members you can talk with, education, traditional values, advertise and support drug-free activities and events.)